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SUPERDUCK NEARSHORE PROCESSES EXPERIMENT: SUMMARY OF STUDIES CERC FIELD RESEARCH FACILITY

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by

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Coastal Engineering Research Center

DEPARTMENT OF THE ARMY
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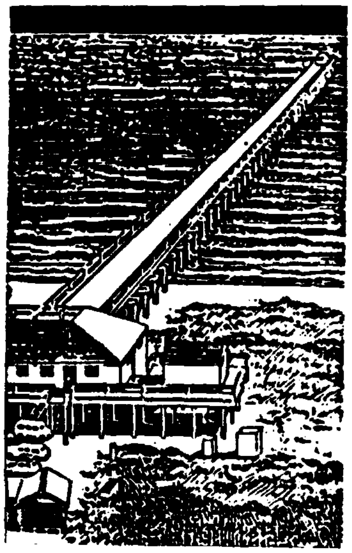

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SUPERDUCK
DUCK, N.C. 1986

US ARMY ENGINEER WATERWAYS EXPERIMENT STATION

September 1988

Final Report

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COASTAL ENGINEERING RESEARCH CENTER

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During September and October 1986, the US Army Engineer Waterways Experiment Station's Coastal Engineering Research Center (CERC) hosted SUPERDUCK, a nearshore processes experiment, at its Field Research Facility located at Duck, North Carolina. The objectives of SUPERDUCK were to develop an improved understanding of coastal processes (currents, waves, sediment transport, and nearshore geomorphology) under a wide variety of conditions and to collect data essential to the development of improved numerical models of coastal phenomena.

SUPERDUCK benefited from the cooperative efforts and resources of engineers and scientists from CERC, 6 other government agencies, 10 universities, 3 foreign countries, and 15 Corps of Engineers district and division offices. This report describes the 30 experiments that comprised SUPERDUCK and summarizes the data sets collected.

SUPERDUCK was organized into three phases: a nonstorm wave phase conducted during
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September, a storm wave phase carried out during October, and an all-weather phase. This is the first in a series of reports which will be published summarizing the data and findings of this unique effort.

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PREFACE

The study herein was authorized by the US Army Corps of Engineers (USACE), Coastal Engineering Area of Civil Works Research and Development. Work was performed under Field Research Facility (FRF) Measurements and Analysis Work Unit 31537, Waves and Coastal Flooding Program, at the Coastal Engineering Research Center (CERC) of the US Army Engineer Waterways Experiment Station (WES). Technical monitors were Messrs. John H. Lockhart, Jr., and John G. Housley, USACE. CERC Program Manager is Dr. C. Linwood Vincent.

Mr. Ronald A. Crowson, SUPERDUCK Experiment Coordinator, compiled the report from information provided by the individual principal investigators under direct supervision of Messrs. Curt Mason, former Chief, FRF; and Thomas W. Richardson, Chief, Engineering Development Division; and under general supervision of Dr. James R. Houston and Mr. Charles C. Calhoun, Jr., Chief and Assistant Chief, CERC, respectively. Final preparation of the manuscript was done by Mr. William A. Birkemeier, Acting Chief, FRF, and Ms. Harriet M. Klein and Mr. Herman C. Miller, FRF. This report was edited by Ms. Shirley A. J. Hanshaw, Information Products Division, Information Technology Laboratory, WES.

Commander and Director of WES during publication of this report was COL Dwayne G. Lee, EN. Dr. Robert W. Whalin was Technical Director.

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SUPERDUCK NEARSHORE PROCESSES EXPERIMENT

SUMMARY OF STUDIES

CERC FIELD RESEARCH FACILITY

PART I: INTRODUCTION

Background

1. With the increasing sophistication of nearshore numerical and physical models, there is a growing need for high quality field data, both to improve our understanding of the physics of the nearshore zone and to use in the testing of these models. Because the collection of field data is both expensive and logistically demanding, it is best obtained through cooperative efforts where the knowledge and resources of a number of investigators are pooled toward a common goal. This report summarizes the activities of SUPERDUCK, a large multi-agency, multi-investigator, nearshore processes experiment hosted by the US Army Engineer Waterways Experiment Station's (WES's) Coastal Engineering Research Center (CERC) at its Field Research Facility (FRF) in Duck, North Carolina (Figure 1) during September and October 1986.

2. The SUPERDUCK experiment was organized into three phases: (a) a nonstorm wave phase during September when mild wave conditions generally dominate, (b) a storm wave phase during October when higher wave conditions are usually experienced, and (c) an all-weather phase conducted throughout September and October. Most of the individual SUPERDUCK studies were located along a 600-m-long section of shoreline centered 500 m north of the FRF's pier (Figure 2). The nonstorm studies of waves, currents, and sediment transport in the surf zone used a wide variety of electronic, visual, and remote sensing techniques. During the storm wave phase, more than 70 electronic sensors (current meters, sonar bed-level sensors, wave gages, and optical backscatter sediment sensors (OBS)) were deployed in three major arrays.

Objective

3. The objectives of the SUPERDUCK experiment were to develop an improved understanding of coastal processes (currents, waves, sediment transport, and nearshore geomorphology) under a wide variety of conditions and to

collect data essential to the development of improved numerical models of coastal phenomena. SUPERDUCK was the third in a series of nearshore experiments, benefiting greatly from experience and data obtained during DUCK82, performed in October 1982 (Mason et al. 1984) and DUCK85, performed from September to October 1985 (Mason et al. 1987).

4. In addition to investigators from CERC, engineers and scientists from 6 other government agencies, 10 universities, 3 foreign countries, and 15 Corps of Engineers district and division offices participated. The role that each played in the overall effort is discussed herein.

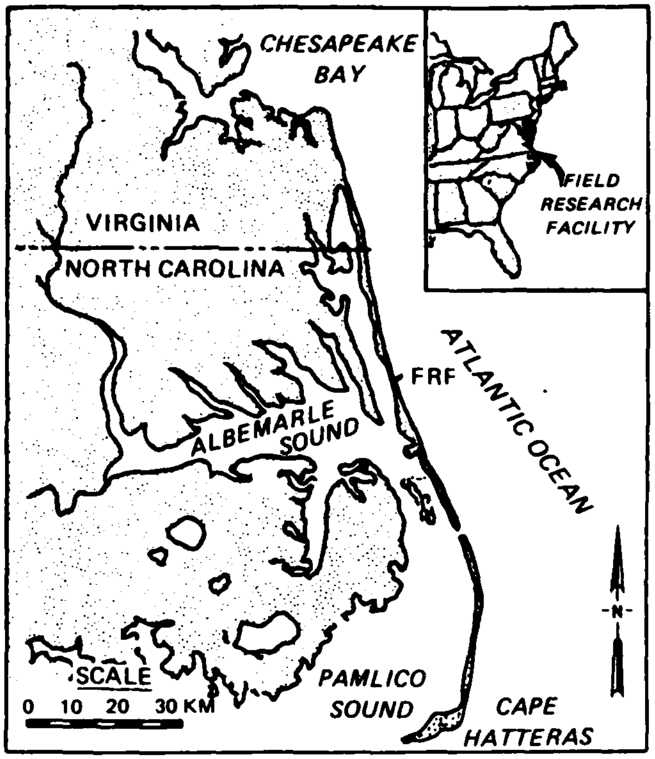

Figure 1. FRF location map

Scope

5. This report describes the 30 experiments that comprised SUPERDUCK. It is the first in a series of reports which will be published summarizing the data and findings of this unique effort. Principal investigators were responsible for the success of their individual experiments and each day reported a record of their activities to the SUPERDUCK coordinator who maintained a daily log. A brief project description and data collection summary are given for each experiment.

6. The organization of this report is as follows: Part II describes the data collection effort and the FRF's support. Part III presents the conditions which occurred in September and describes the nonstorm wave studies. Part IV describes the October conditions and storm wave studies. Part V discusses the all-weather studies, and Part VI is a summary. Appendix A is a tabular summary of the data collected on the FRF computers.

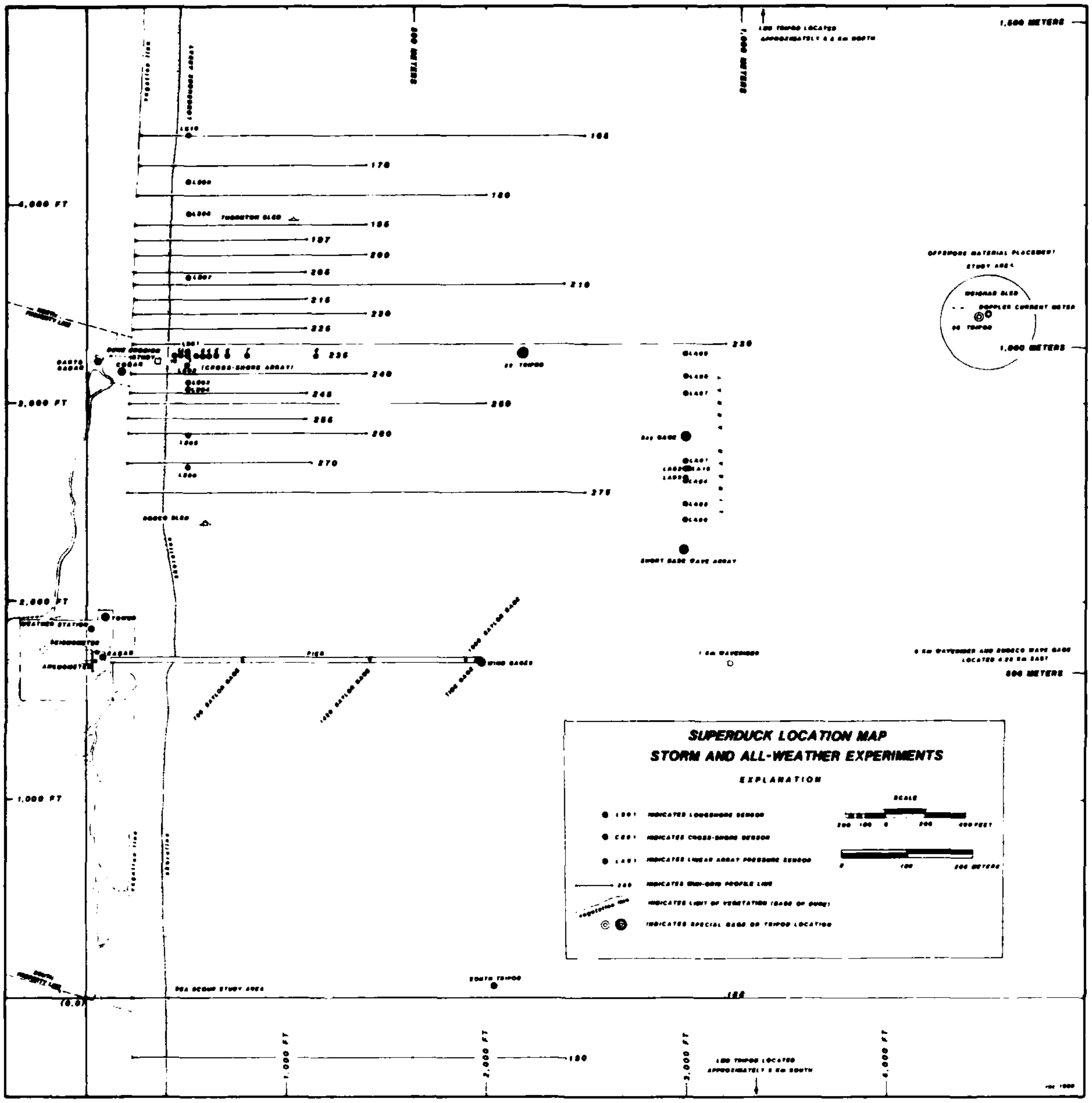

Figure 2. Locations of SUPERDUCK experiments

7. Further information on SUPERDUCK or the data collected can be obtained by contacting Herman C. Miller, SUPERDUCK Data Management Coordinator, at the following address:

CERC Field Research Facility
SR Box 271
Kitty Hawk, North Carolina 27949

PART II: BASIC DATA COLLECTION AND FRF SUPPORT

8. A primary factor contributing to the success of SUPERDUCK was the capability of the FRF to deploy and support the large number of oceanographic instruments required during the experiment (Figure 3). The FRF routinely collects long-term measurements of both processes (winds, waves, tides, etc.) and responses (high precision bathymetric surveys), and this basic monitoring program provided the framework for all three phases of the SUPERDUCK experiment.

Figure 3. FRF equipment being used to deploy a buoy

Process Data

9. Most of the data from the instruments deployed during SUPERDUCK were collected by the FRF minicomputers (either a Data General NOVA-4 or a Digital Equipment VAX-11/750) on Eastern Standard Time (EST) unless stated otherwise. Each instrument channel was assigned a unique number, as listed in Table 1. Coordinates given in Table 1 refer to the local horizontal coordinate system of the FRF which is shown in Figure 2. Elevations are relative to the National Geodetic Vertical Datum (NGVD) of 1929. A log giving the operational status of each gage is included in Appendix A.

Table 1

Summary of SUPERDUCK Instrumentation*

Experiment	Gage Name	Gage Type	Gage Number Other	Gage Number U	Gage Number V	Gage Location Alongshore m	Gage Location Cross-Shore m	Gage Location Elevation m	Water Depth m
Linear wave array	LA01	Pressure	111			826	914	-7.9	-8.3
	LA02	Pressure	121			816	914	-7.8	-8.2
	LA03	Pressure	131			801	915	-7.7	-8.2
	LA04	Pressure	141			796	914	-7.9	-8.3
	LA05	Pressure	151			761	914	-7.8	-8.1
	LA06	Pressure	161			736	914	-7.7	-8.2
	LA07	Pressure	171			930	914	-7.8	-8.2
	LA08	Pressure	181			956	914	-7.8	-8.3
	LA09	Pressure	191			990	914	-7.8	-8.3
	LA10	Pressure	101			816	919	-7.7	-8.0
Longshore current array	LS01	EMCM		219	319	992	155	-0.8	-1.4
	LS02	EMCM		229	329	972	156	-0.8	-1.8
	LS03	EMCM		239	339	945	155	-1.2	-1.9
	LS04	EMCM		249	349	935	155	-0.8	-1.8
	LS05	EMCM		259	359	865	155	-0.8	-1.1
	LS06	EMCM		269	369	816	155	-0.8	-1.0
	LS07	EMCM		279	379	1106	155	-0.9	-1.0
	LS08	EMCM		289	389	1205	155	-0.7	-0.8
	LS09	EMCM		299	399	1256	155	-0.8	-1.0
	LS10	EMCM		209	309	1325	155	-0.7	-0.8
Cross-Shore current array	CS01A	EMCM		219	319	992	155	-0.8	-1.4
	CS10	EMCM		409	509	991	145	-0.9	-1.2
	CS11	EMCM		449	549	991	136	-0.9	-1.2
Cross-Shore wave array	CS01	Pressure	411			989	155	-0.8	-1.3
	CS02	Pressure	421			991	169	-0.7	-1.1
	CS03	Pressure	431			991	178	-0.7	-1.3
	CS04	Pressure	441			991	187	-0.7	-1.6
	CS05	Pressure	451			990	200	-1.0	-1.2
	CS06	Pressure	461			991	217	-1.1	-2.3
	CS07	Pressure	471			991	247	-1.5	-3.2
Sallenger's cross-shore sonar array	CS01	Sonar Altimeter	418			989	155	-1.0	-1.3
	CS02	Sonar Altimeter	428			991	169	-1.0	-1.1
	CS03	Sonar Altimeter	438			991	178	-1.0	-1.3
	CS04	Sonar Altimeter	448			991	187	-1.0	-1.6
	CS05	Sonar Altimeter	458			990	200	-1.2	-1.8
	CS06	Sonar Altimeter	468			991	217	-1.4	-2.3
	CS07	Sonar Altimeter	478			991	247	-1.5	-3.2
FRF basic instrumentation	FRF	EMCM		679	689	18	619	-4.9	-6.6
		Pressure	621			18	619	-5.1	-6.6
		PUV	21			18	619		-6.6
		Waverider	630				6 km	0.0	-18.9
		Waverider	640						
		Baylor Wave gage	625			516	579	-6.7	-7.7

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*Definitions:

(sheet 1 of 2)

OBS - Optical Backscatter Sediment Sensor
EMCM - Electromagnetic Current Meter
U - Cross-shore component of velocity, positive offshore
V - Longshore component of velocity, positive to the right (southward)
PUV - Combination Pressure/Current Meter gage for determining directional wave spectra

Table 1 (Concluded)

Experiment	Gage Name	Gage Type	Gage Number Other	Gage Number U	Gage Number V	Gage Location Alongshore m	Gage Location Cross-Shore m	Gage Location Elevation m	Water Depth m
		Baylor Wave gage	625			516	579	-6.7	-7.7
		Baylor Wave gage	675			516	451	-4.7	-6.9
		Baylor Wave gage	645			516	238	-1.9	-2.7
		Atm. Pressure	616			569	12	3.0	
		Air Temperature	624			569	12	3.0	
		Wind Speed	632			516	21	19.0	
		Wind Direction	633			516	21	19.0	
		Tide	1			514	596	0.0	-7.7
Weishar's inner tripod -6.7 m (-22 ft)	W01	EMCM				993	665	-6.55	-6.7
		Pressure				993	665	-6.10	-6.7
		OBS	1			993	665	-6.65	-6.7
		OBS	2			993	665	-6.64	-6.7
		OBS	3			993	665	-6.45	-6.7
		OBS	4			993	665	-6.20	-6.7
		OBS	5			993	665	-5.65	-6.7
Weishar's offshore tripod, -11.6 m (-38 ft)	W02	EMCM				1047	1361	-11.45	-11.6
		Pressure				1047	1361	-10.85	-11.6
		OBS	1			1047	1361	-11.55	-11.6
		OBS	2			1047	1361	-11.54	-11.6
		OBS	3			1047	1361	-11.35	-11.6
		OBS	4			1047	1361	-11.10	-11.6
		OBS	5			1047	1361	-10.55	-11.6
Weishar's 635/12 (North)	W04	Pressure				6 km north			-6.7
Weishar's 635/12 (South)	W05	Pressure				10 km south			-6.7
Andrew's short-base wave array	AN01	Pressure				693	915		-8.3
Thornton's sled	T01	EMCM (4 ea.)				Mobile platform within the minigrid			
		Pressure (5 ea.)							
		Wind Speed							
		Wind Direction							
Clausner's current sensors	C01	Ducted Impeller	1			1047	1361	-4.6	-11.6
	C02	Ducted Impeller	2			1047	1361	-7.6	-11.6
	C03	Ducted Impeller	3			1047	1361	-9.8	-11.6
Long/Hubertz Sensors		Impellor Vane Anemometer				514	598	22.0	
		Vertical Impellor Anemometer				514	598	22.0	
		Hot Film Anemometer				514	598	18.7	
		Vertical Wind Speed				514	598	18.7	
		3-Axis Impellor Anemometer				514	598	18.7	
		Air Temperature (Platinum wire)				514	598	18.7	
		Air Temperature (Chromel Constantan)				514	598	18.7	
		Air Temperature (Thermistor)				514	598	18.7	
		Humidity (Thin Film Capacitor)				514	598	18.7	
		Humidity (Optical Absorption)				514	598	18.7	
		Humidity (Relative Humidity)				514	598	18.7	
		Wind Speed (Cup Anemometer)				514	598	13.7	
		Sea Temperature				514	598	0.0	-7.7
Appell's current meter	AP01	Doppler				1047	1361		-11.6

10. Data collection on the VAX computer began in October and consisted of 4-hr-long records centered on every high and low tide (Table 2). Each

Table 2

VAX Data Collection Schedule* - October 1986

Date	Time, EST	Date	Time, EST	Date	Time, EST
6 Oct	1400	7 Oct	0117	8 Oct	0200
	1907		0735 H		0830 H
			1400		1500
			2000 H		2100 H
9 Oct	0300	10 Oct	0400	11 Oct	0540
	0930 H		1030 H		1200 H
	1600		1700		1820
	2200 H		2320 H		
12 Oct	0040 H	13 Oct	0130 H	14 Oct	0230 H
	0645		0745		0845
	1300 H		1400 H		1500 H
	1915		2015		2115
15 Oct	0330 H	16 Oct	0400 H	17 Oct	0450 H
	0945		1020		1100
	1600 H		1630 H		1710 H
	2200		2240		2320
18 Oct	0530 H	19 Oct	0000	20 Oct	0040
	1140		0610 H		0650 H
	1750 H		1220		1300
			1830 H		1900 H
21 Oct	0100	22 Oct	0200	23 Oct	0230
	0730 H		0810 H		0900 H
	1340		1430		1515
	1950 H		2030 H		2115 H
24 Oct	0315	25 Oct		26 Oct	2300 H
	0930 H		0400		0500
	1600		1030 H		1130 H
	2200 H		1700		1800
27 Oct	0000 H	28 Oct	0100 H	29 Oct	0130 H
	0600		0700		0800
	1230 H		1330 H		1400 H
	1900		1930		2030
30 Oct	0230 H	31 Oct	0330 H		
	0900		0930		
	1500 H		1550 H		
	2100				

* VAX collection periods began at above times and continued for 4 hr.
H High tide.

collection was comprised of seven contiguous time series (representing the voltage output of the sensor), each with 4,096 data values sampled at 2 Hz. After the voltages were converted to engineering units using the sensor calibration factors, the time series were edited to eliminate erroneous jumps and spikes. The mean of the time series was computed and removed, and estimates of the spectral density were obtained. Spectral estimates were computed with

high statistical stability (60 deg of freedom) and a spectral resolution of 0.0117 Hz.

11. Data collection on the NOVA-4 differed from that on the VAX in that 35-min data records, sampled at 2 Hz, were collected every 6 hr in September and hourly in October. Time series data were transferred to the VAX computer and processed as described above.

12. In addition to SUPERDUCK instrumentation, the basic measurements program of the FRF continued to provide background data on the weather, waves, tides, and currents occurring during the experiment. This program consists of a combination of instrument measurements and observations. Details of the observations and instrumentation used in this program can be found in Miller et. al (1986) and in the FRF Preliminary Data Summary reports for September and October 1986 (FRF 1986).

Survey Data

13. During the experiment, numerous bathymetric data were collected using the FRF's Coastal Research Amphibious Buggy (CRAB)-Zeiss surveying system which consists of a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the CRAB, a 10.7-m-high self-propelled mobile tripod on wheels. Besides being used for surveying, the CRAB was also used for precise positioning, deployment, and retrieval of many of the SUPERDUCK instruments (Figure 4).

14. All surveying was done in a 600-m by 600-m region designated as the "minigrid" area which was centered on the primary instrument line. During each complete survey of the minigrid, a total of 20 profile lines was surveyed. The location and length of these lines are illustrated in Figure 2 and in greater detail in Figure 5. Line spacing and length were designed to minimize survey time while maximizing the coverage closest to shore. Maximum line length was also affected by wave and weather conditions along with availability of the CRAB.

15. A total of 13 minigrid surveys was obtained during the experiment (Table 3). All 20 minigrid profile lines were surveyed except when high waves restricted the operation of the CRAB. Additional surveys of single lines near the primary instrument line were also obtained.

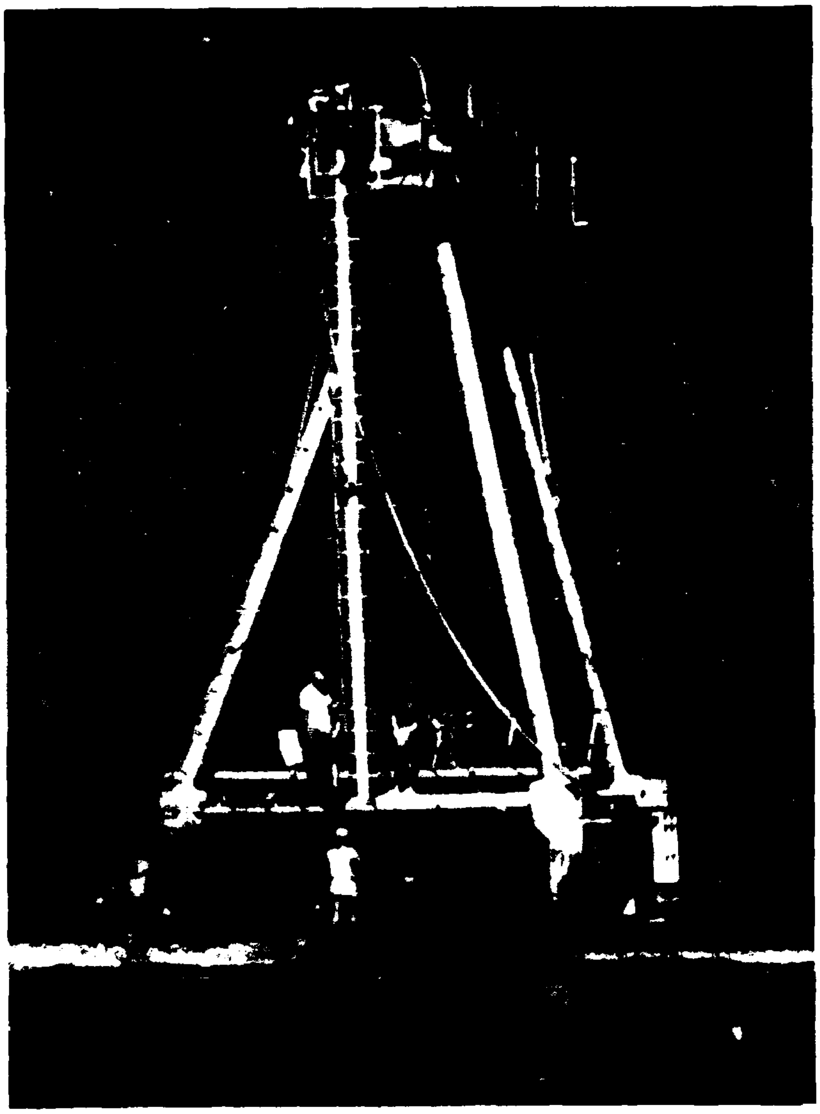

Figure 4. Deploying pipe-mounted current meter

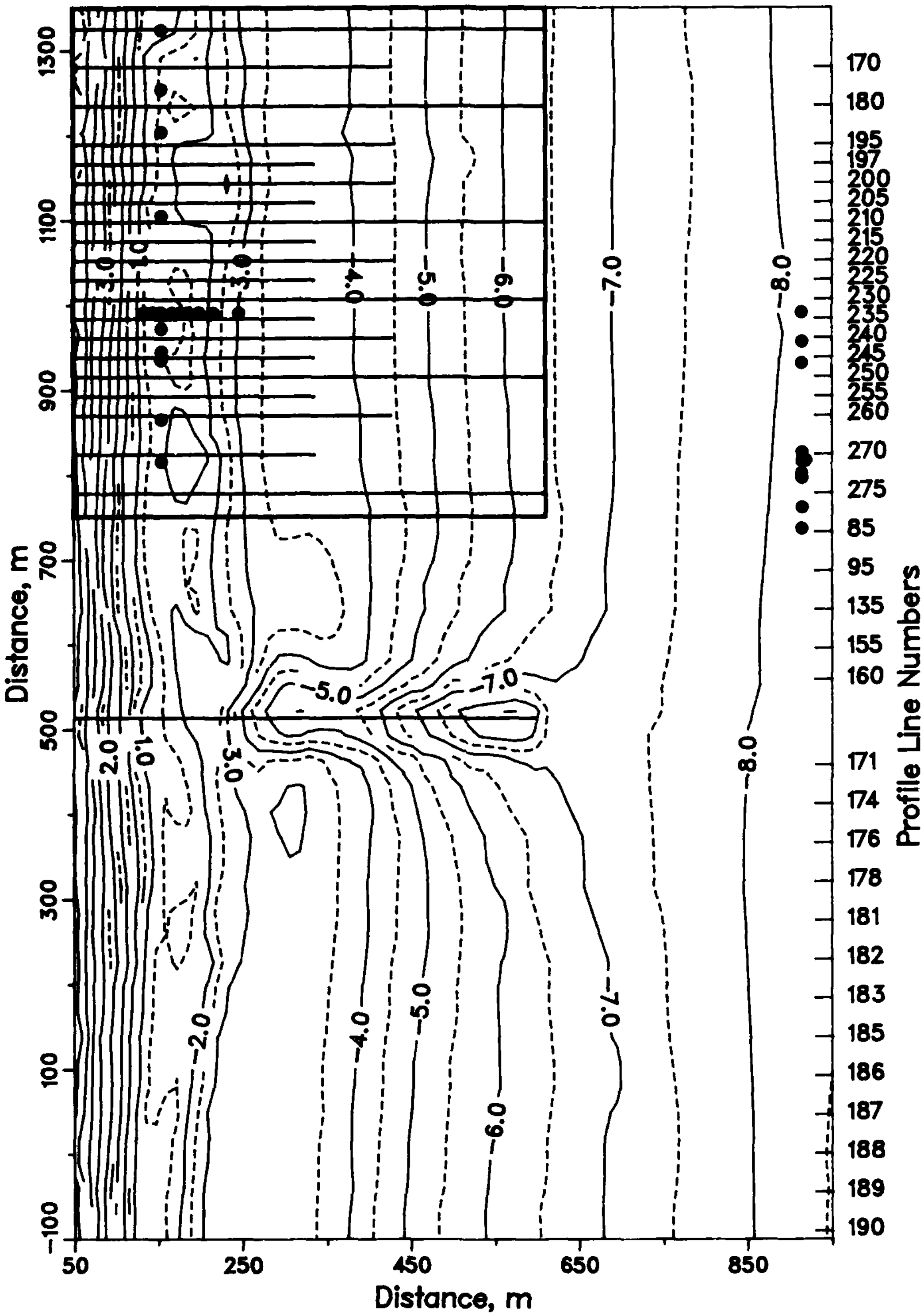

Figure 5. FRF bathymetric map, 12 September 86, showing minigrid area and location and length of profile survey lines (circles indicate major instrument arrays used in October storm-wave experiment)

Table 3

SUPERDUCK Bathymetric Surveys

Survey No.	Type	Date	Profile Lines Surveyed
1	Minigrid	4 Sep	188, 190
2	Minigrid	12 Sep	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275
3		18 Sep	210, 230, 188, 190
4		20 Sep	225, 230, 235, 240, 245, 250, 255, 260
5	Minigrid	26 Sep	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275
6		30 Sep	230, 235
7		2 Oct	233
8	Minigrid	6 Oct	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275, 188, 190
9		7 Oct	235
10		8 Oct	235
11	Minigrid	9 Oct	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275
12		10 Oct	165, 170, 180, 195, 197, 200, 210, 220, 230
13	Minigrid	11 Oct	165, 170, 180, 195, 200, 210, 220, 230, 235, 240, 250, 260, 270, 275
14	Minigrid	12 Oct	165, 170, 180, 195, 200, 210, 220, 230, 235, 240, 250, 260, 270, 275
15	Minigrid	13 Oct	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275
16	Minigrid	14 Oct	165, 170, 180, 195, 200, 205, 210, 220, 230, 235, 240, 245, 250, 255, 260, 270, 275
17	Minigrid	15 Oct	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275
18	Minigrid	16 Oct	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275
19		17 Oct	195, 210, 230, 188, 190
20	Minigrid	18 Oct	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275
21	Minigrid	20 Oct	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275
22		21 Oct	170, 230
23	Minigrid	22 Oct	170, 180, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 270, 275

* See Figure 2 and Figure 3 for location and length of lines.

PART III: NONSTORM WAVE STUDIES

16. These studies were conducted during September and included the sediment trap, surf zone currents, photopole, surf zone waves, and Littoral Environment Observation (LEO) experiments.

17. Figure 6 illustrates the complex nearshore morphology within the minigrid on 4 September at the beginning of the experiment. Conditions during

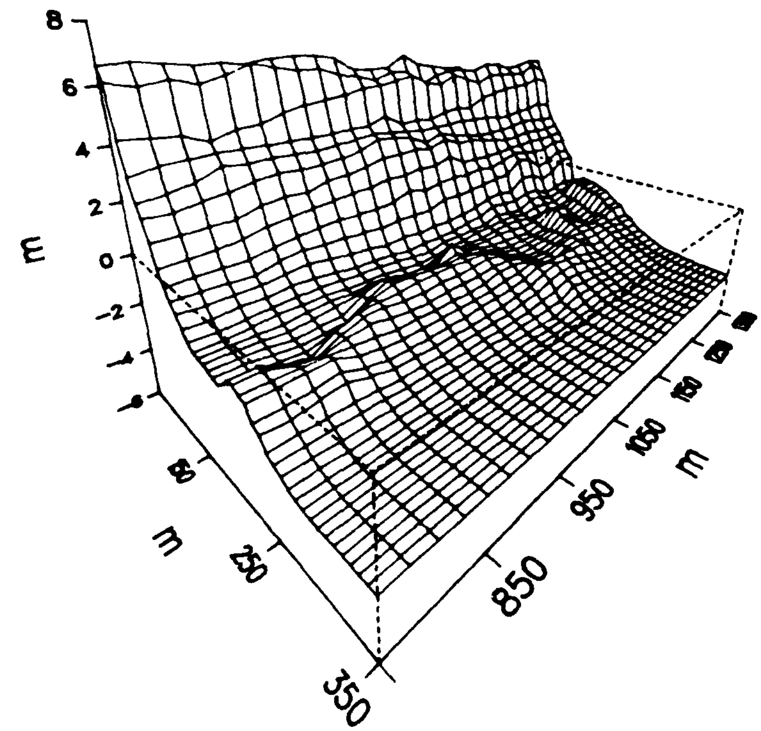

Figure 6. Minigrid bathymetry, 4 September 1986

September were generally ideal with wave heights remaining below 1.5 m for the entire month. Figure 7 shows the general climatic and sea state conditions during September, and Table 4 lists the daily observations which supplemented the automated data collection.

Surf Zone Sediment Trap

18. Principal investigators were Dr. Nicholas C. Kraus and Ms. Julie Dean Rosati of CERC, and Dr. Lindsay D. Nakashima of the Louisiana Geological Survey.

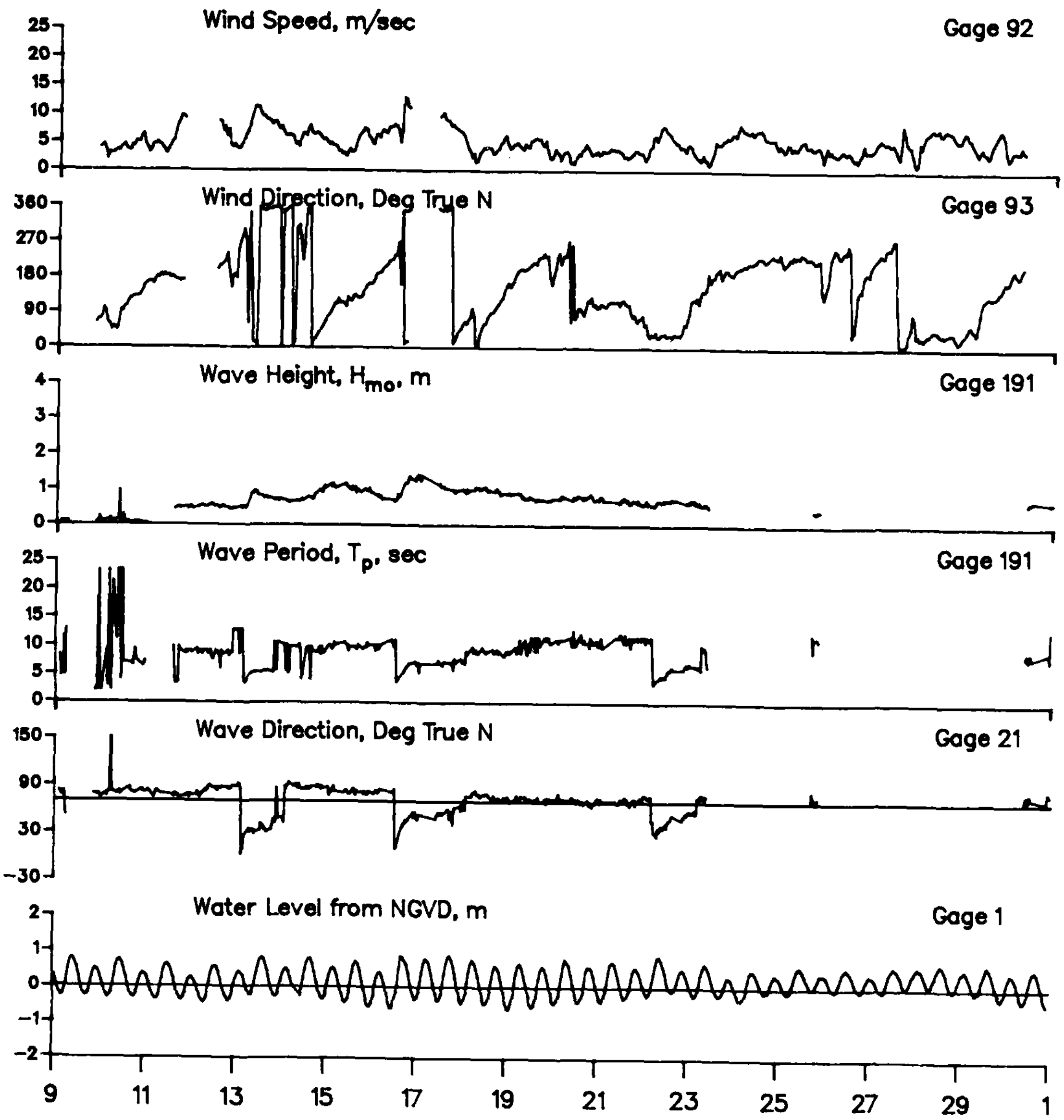

Figure 7. General conditions for September 1986

Table 4

FRF Supplemental Observations September 1986

		Wave Approach Angle at Pier End deg from True N		Radar Wave		Water Characteristics at Pier End		
Day	Time	Primary	Secondary	Angle deg from True N	Width of Surf Zone, m	Temp. °C	Density g/cc	Secchi Vis., m
1	0740	80		85	84	22.3	1.0204	1.2
2	0604	80	60	80	76	22.5	1.0204	1.5
3	0704	95	45		84	23.0	1.0204	2.4
4	0616	80		80	87	23.1	1.0201	1.5
5	0605	90		80	67	23.2	1.0208	1.2
6	0608	90		80	79	23.8	1.0210	2.1
7	0610	80		80	78	23.8	1.0208	2.1
8	0718	90		85	7	24.0	1.0211	2.4
9	0605	60	80	80	91	22.7	1.0212	2.1
10	0705	90		80	64	22.7	1.0206	2.4
11	0700	80		75	55	22.7	1.0208	3.0
12	0620	135			61	22.1	1.0220	3.4
13	0700	20		40	119	22.1	1.0222	1.5
14	0805	20	105		70	21.8	1.0224	2.7
15	0627	100		90	79	22.2	1.0212	2.1
16	0654	100		80	58	22.3	1.0222	1.5
17	0630	50	60	50	137	21.3	1.0225	1.2
18	0734	50	75		88	20.7	1.0224	0.9
19	0600	105			52	21.2	1.0224	1.2
20	0600	90			18	21.5	1.0224	1.8
21	0610	75		inoperative	61	21.5	1.0218	2.1
22	0748	40	50	60	75	22.1	1.0222	0.9
23	0647	55			72	22.0	1.0218	3.0
24	0557	80			55	22.3	1.0222	1.5
25	0619	100			41	22.0	1.0221	1.2
26	0735	120			21	23.4	1.0220	1.8
27	0541	90			52	25.5	1.0216	1.2
28	0700	40		60	123	24.2	1.0208	0.9
29	0648	80		90	91	24.3	1.0203	1.2
30	0715	125			55	23.7	1.0214	3.4

Objective

19. The objective was to measure the longshore sediment transport rate and local waves and currents in the surf zone.

Experiment plan

20. Specially designed portable traps were deployed in the surf zone together with one or two electromagnetic current meters mounted on tripods (Figures 8 and 9). The traps measured the vertical distribution of the transport rate from the bed to the water surface. Because the traps must be attended by operators, these experiments were limited to surf zone environments with significant breaking wave heights less than about 1 m. The current meters were connected by cable to a newly-developed field data logger based around a superminicomputer. The data logger allowed almost real-time data verification at the site as well as basic analysis. The photopole group

collected wave data in support of the sediment trapping for all major data runs.

21. Three types of trap experiments were performed. The major effort was directed toward *temporal sampling*, in which traps were deployed one after another at a fixed location. Typically, four to eight trap interchanges were made. Temporal sampling allows ready comparison of transport rates, currents, and waves, all of which vary in time. The second type of experiment was termed *longshore sampling*, whereby several traps were placed across the surf zone at the same time to measure the cross-shore distribution of the longshore sediment transport rate. The third type was a *consistency check*, made by placing two traps near each other to allow com-

Figure 8. Sediment trap

Figure 9. Sediment traps being deployed

parison of trapped quantities of sediment under presumably nearly equal longshore transport conditions. Typical sampling intervals for a single trap were 5 to 8 min. Sediment samples from selected runs on each day were retained for grain size analysis.

Location

22. The surf zone sediment trap experiment was conducted approximately 100 m south of the north FRF property line. During the study the principal investigators established a convenient local baseline (tied into the FRF coordinate system) and conducted their own profile surveys using a Zeiss survey system mounted on the pier or the main system housed in the FRF main building. The line of photopoles was used as a reference point in most of the surveys and trap experiments.

Data collection schedule and summary

23. Summaries of experiment times, types, and supplemental data are given in Tables 5-8.

Table 5
Summary of Surf Zone Sediment Trap Experiment for September

Run No.	Date	Time, EDT	Type of Experiment and Sampling Interval
11	11	1745-1755	Longshore, 6 traps
12	12	1037-1047	Rip current, 6 traps
20	15	1345-1408	Temporal, 3 trap pairs, 7/8/8 min
21	15	1630-1654	Temporal, 1 trap, 3 repetitions, 8/8/8 min
23	16	0922-0932	Consistency, 1 trap pair
24	16	0945-0955	Consistency, 1 trap pair
26	16	1116-1126	Longshore, 10 traps
27	18	1225-1249	Temporal, 4 trap pairs, 6-min interval
28	18	1453-1524	Temporal, 5 trap pairs, 6-min interval
30	19	1016-1026	Longshore, 6 traps
32	19	1230-1254	Temporal, 4 trap pairs, 6-min interval
33	20	1045-1133	Temporal, 8 traps, 6-min interval
34	20	1500-1548	Temporal, 8 traps, 6-min interval including 2 consistency (2 pairs)
35	21	1046-1056	Consistency, 1 trap pair
37	21	1345-1509	Temporal, 14 trap repetitions, 6-min interval, including 2 consistency runs
38	22	0730-0810	Temporal, 8 traps, 5-min intervals
39	22	1600-1625	Temporal, 5 trap pairs, 5-min intervals
40	22	1750-1756	Longshore, 10 traps, 6-min intervals
42	23	1035-1100	Temporal, 5 traps

Table 6

Summary of Surf Zone Sediment Trap Support Data for September 1986*

Run No.	Date	Current Meters	Bathymetry and Gage Surveys	Location Rel. to Photopoles	Tide	Samples Retained
11	11	None	Line 1-12, PP	Between 4.5 & 13.5	Falling	All traps
12	12	None	Rip region, PP	Between 4.6 m & 46 m (15 & 150 ft) offshore	Low	All traps
20	15	2	Lines 1-9, PP, 2 CM	Between 6 & 7	Rising	Traps 3, 4
21	15	2	2 CM	Pole 4	Rising	None
23	16	1	Lines 1-6, PP, est. 1 CM	Pole 7	Falling	None
24	16	1	1 CM	Pole 8	Falling	None
26	16	2	2 CM	Between 6.5 & 17.5	Falling	All traps
27	18	2	Lines 1-4, PP, 2 CM	Poles 5 & 8	Falling	None
28	18	2	2 CM	Poles 7 & 9	Falling	Trap 5
30	19	2	Lines 1-6, PP, est. 1 CM, 1 CM	Between 1.5 & 7	High	None
32	19	2	2 CM, Partial malfunction	Poles 6 & 7	Falling	Trap 7
33	20	2	Lines 1-3, PP, est. 2 CM	Pole 5.5	High	All traps
34	20	2	2 CM	Between 8 & 9	Low	Traps 9 & 10
35	21	2	Lines 1-3, PP, est. 2 CM	Poles 5.5 & 6.5	High	None
37	21	2	2 CM	Pole 8.5	Falling	Traps 15 & 16
38	22	2	Lines 1-9, One line S of Line 1, PP, est. 2 CM	Pole 5.5	Rising	None
39	22	2	2 CM	Poles 7 & 9	Rising	Traps 1 & 2
40	22	2	2 CM	Between 5 & 9.5	Low	None
42	23	2	Lines 1-8, PP, 2 CM	Between 4 & 5	Rising	Trap 2

*Notes: Survey lines 1-12 on a local grid system from a baseline set parallel to trend of shoreline in experiment area; spacing of 15 m (50 ft) between lines.

PP - survey on photopole line.
CM - current meter.

Table 7

Summary of Photopole Data in Support of Surf Zone Sediment Trap Experiments

Run No.	Date	Photopole Data
11	11	Start 1744; 3901 frames, Poles 5-22
12	12	Start 1037; 3892 frames, Poles 5-22
20	15	Start 1345; 2 x 3800 frames, Poles 6-17
21	15	Start 1631; 2 x 3800 frames, Poles 3-11
23	16	None
24	16	Start 0950; 3899 frames, Poles 6-22, missing 1st 5 min; camera controller problem at end
26	16	Start 1114; 3901 frames, Poles 6-22
27	18	Start 1225; 2 x 3800 frames, Poles 6-13, Camera 5 problem at start
28	18	Start 1453; 2 x 3800 frames, Poles 6-13
30	19	Start 1015; 3900 frames, Poles 2-22, Camera 4 failure
32	19	Start 1230; 2 x 3800 frames, Poles 6-13
33	20	Start 1046; 4 x 3800 frames, Poles 3-8, 1-min gap between sets 2 & 3
34	20	Start 1500; 4 x 3800 frames, Poles 7-10, short gap between sets 2 & 3
35	21	None
37	21	Start 1345; 8 x 3800 frames, Poles 8-9, some problems with Camera 5
38	22	Start 0730; 4 x 3800 frames, Poles 5-6, many problems
39	22	Start 1600; 2 x 3800 frames, Poles 7-9
40	22	Start 1748; 3900 frames, Poles 5-22
42	23	Start 1035; 2 x 3800 frames, Poles 4-5, many problems with cameras

Table 8

Comments on Quality of Surf Zone Sediment Trap Data for September

Run No.	Date	Comments
11	11	Malfunction in current meter system; wave conditions rough; trap data of acceptable quality
12	12	Malfunction in current meter system; trap data of good quality
20	15	North trap in deeper water, south trap in shallower water at same distance from shoreline; moderate longshore current; overall high quality
21	15	Wave conditions rough; strong current; south location as in Run 20; overall good quality
23	16	Traps separated by 3 m; moderate current; overall high quality
24	16	Traps separated by 1 m; moderate current; overall high quality
26	16	Moderate current; high quality
27	18	Moderate/strong longshore current; high quality
28	18	Strong longshore current; high quality
30	19	High swell; several traps became dislodged; 2 traps unsuccessful; moderate current; significant transport of gravel in swash zone; limited quality
32	19	Strong current; first 14 min of current meter record (2-1/4 trap intervals of 4 intervals total) lost; trap data of high quality
33	20	Deeper water, high tide, weak/moderate longshore current; good quality
34	20	Low tide; performed in very strong feeder current of a rip; overall high quality
35	21	Moderate current; good quality
37	21	Performed in moderately strong feeder of a rip; current weaker at offshore cm; overall high quality
38	22	Strong current; waves arriving at large angle; water unusually turbulent due to mixed swell and chop; trap 6 fell over several times; reduced number of streamers in Traps 7 & 8; experiment discontinued due to high breakers on beach face and strong current; overall good quality
39	22	Moderate/strong current; traps located 5-10 m downdrift of current meters; good quality
40	22	Outermost three traps in deeper water not completely set in bottom for first 2 min; good placement of swash zone traps; moderate current; fair quality
42	23	Very weak longshore current to north, with some reversals in direction; high (1- to 1.5-m) waves breaking at trap positions; near the shoreface; poor overall quality

Photopole

24. Principal investigators were Mr. Bruce A. Ebersole and Dr. Steven A. Hughes of CERC and Dr. Shintaro Hotta of Tokyo Metropolitan University, Japan.

Objectives

25. The objectives were to (a) collect high quality water level and wave height data in and just outside the surf zone during typical and severe wave events, and (b) collect wave data in support of the sediment trap experiment.

Experiment plan

26. A shore-perpendicular transect of photopoles (2-in. steel pipes with horizontal calibration rods) was jetted into the seabed using a portable

land-based air compressor and handheld lance (Figure 10). The CRAB was used to install photopoles in water depths greater than 1.5 m. Seabed elevations in the vicinity of the photopole transect and elevations of the lower calibration rods were surveyed daily to establish vertical control for the measurements.

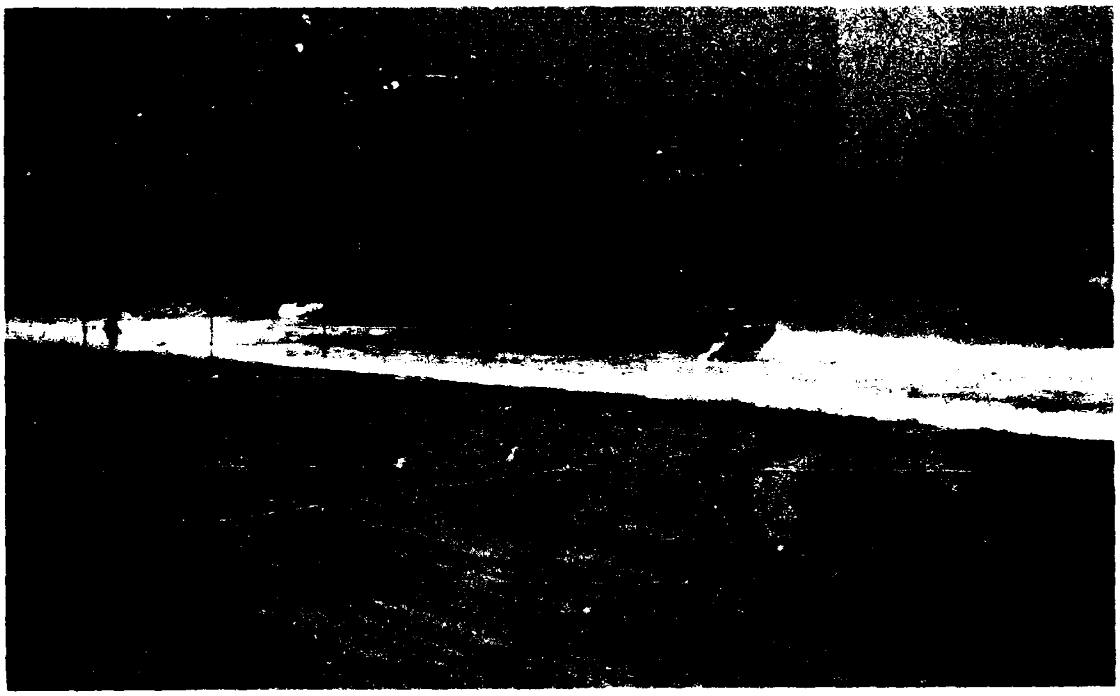

Figure 10. Photopoles

27. A battery-powered system of 6 synchronized Bolex 16 mm movie cameras was used to film water surface fluctuations at each photopole (Figure 11). The camera system was mounted on a 6.1-m-high scaffold erected on the beach berm approximately 122 m south of the photopole line. Cameras were fitted with appropriate lenses such that each camera typically filmed 2 or 3 poles. A filming or sampling rate of 5 Hz was used for all filming runs.

Location

28. The photopole experiment was conducted 425 m north of the FRF pier in the immediate vicinity of the sediment trap experiment. A second line of photopoles was erected 140 m north of the pier in anticipation of high wave conditions. Six photopoles, mounted on sleds, were also planned for deployment along this second photopole transect to measure waves in deeper water.

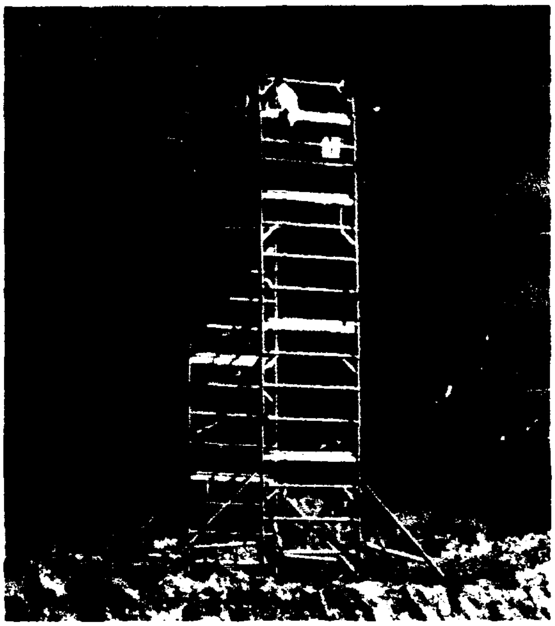

Figure 11. Photopole camera system

Unfortunately, the weather did not produce storm wave conditions during the study period.

Data analysis

29. Data collected during the first phase of the experiment in conjunction with the sediment trap experiment are summarized in Table 9. Information is provided as follows:

a. Run identification number.

b. Day and time run initiated.

c. Number of poles photographed (22 is the seawardmost pole).

d. Tide elevation at the FRF pier.

e. Significant wave height and peak spectral period, as measured by the FRF's Gage 621.

f. Wave direction associated with the peak spectral period (from FRF's Gage 21).

g. Poles whose calibration rods were surveyed.

h. Poles where seabed elevations were surveyed.

Table 9

Summary of Photopole Experiment Runs

Run No.	Date	Time, EDT	Pole No.	Tide* m, NGVD	H_{mo}, m*	T_p, sec*	Dir*	Rod Elev.	Sea Elev.
1	11 Sep	1744	5-22	0.05	0.57	10.0	74	1-22	1-22
2	12 Sep	1037	5-22	-0.25	0.52	10.0	88	1-22	1-22
3	12 Sep	1300	9,12	0.35	0.55	9.0	85	1-22	1-22
4	13 Sep	1425	4-22	0.66	0.86	5.0	38		1-22
5	13 Sep	1535	4-22	0.79	0.86	5.0	38		1-22
6	14 Sep	1558	3-14	0.68	0.92	9.0	89		1-22
7	14 Sep	1713	3-22	0.80	0.95	10.0	88		1-22
8	15 Sep	1345	6-17	-0.23	0.88	10.0	83	1-8	1-13
9	15 Sep	1445	5-22	0.03	0.90	10.0	85	1-8	1-12,14
10	15 Sep	1552	5-22	0.37	0.85	11.0	78	1-8	1-12,14
11	15 Sep	1631	3-11	0.49	0.86	11.0	82	1-8	1-12,14
12	16 Sep	0950	6-22	-0.14	0.60	11.0	81	1-22	1-22
13	16 Sep	1114	6-22	-0.46	0.58	11.0	82	1-22	1-22
14	18 Sep	1225	6-13	-0.15	1.02	8.0	80	1-13	1-13
15	18 Sep	1453	6-13	-0.45	1.02	8.0	79	1-13	1-13
16	19 Sep	1015	3-22	0.50	0.80	9.0	77		1-22
17	19 Sep	1100	3-22	0.35	0.80	9.0	77		1-22
18	19 Sep	1230	6-13	-0.07	0.80	9.0	77		1-22
19	20 Sep	1046	3-8	0.70	0.81	10.0	73		1-22
20	20 Sep	1500	7-10	-0.40	0.81	11.0	69		1-22
21	21 Sep	1345	1-4,8-9, 20-22	0.11	0.78	12.0	75		1-5,7-8, 10-11,13
22	22 Sep	0730	5-6	0.28	0.73	4.0	29		1-7
23	22 Sep	1600	7-9	-0.04	0.78	6.0	38		1-7
24	22 Sep	1748	5-22	-0.07	0.77	6.0	55		1-7
25	23 Sep	1035	4-5	0.62	0.63	9.0	65		1-5

* Estimated from tide data from NOS tide gage at end of pier; wave data from PUV meter (Gage 21); wave directions relative to True North (shore normal = 70 deg).

Surf Zone Currents

30. Principal investigators were Dr. Rao S. Vemulakonda and Dr. Nicholas C. Kraus of CERC.

Objective

31. The objective was to obtain synoptic current measurements in the surf zone for comparison to numerical model predictions. Some of these measurements were to be used to support the sediment trap experiments.

Experiment plan

32. Equipment malfunctions plagued this project, and it was later discovered that problems with the Marsh-McBirney electromagnetic current meters prohibited the experiment's completion.

Surf Zone Rip Currents

33. Principal investigator was Dr. Robert A. Dalrymple of the University of Delaware.

Objective

34. The objective was to make detailed measurements of currents within the surf zone, particularly rip currents generated during nonstorm conditions.

Experiment plan

35. A portable array of two electromagnetic current meters and pressure wave gages was placed at selected points within the surf zone. This experiment was carried out in conjunction with the sediment trap experiment.

Surf Zone Waves

36. Principal investigator was Dr. James T. Kirby of the University of Florida.

Objective

37. The objective was to compare the photopole wave data to data collected simultaneously from two resistance wave staff gages and two pressure sensors that were attached to the photopoles.

Experiment plan

38. Two resistance wave staff gages and two pressure sensors were mounted on photopoles, and data were collected on the MICROVAX computer located in the north trailer in conjunction with the data collection periods of the photopoles and other sediment transport experiments.

LEO Measurements

39. Principal investigators were Ms. Joan Pope, and Messrs. Clifford L. Truitt, Stephen E. Wagner, and W. Jeff Lillycrop of CERC.

Objective

40. The objective was to improve Littoral Environment Observation (LEO) measurements by testing existing and proposed technology relative to accurate field observations of currents, waves, and sediment movement.

Experiment plan

41. Numerous methods of testing the LEO techniques were tried. Coincidental data collected by the FRF were used to verify measurements made by the LEO observers such as longshore drift, wave height and period, and wind speed and direction. Passersby and volunteers provided a test group to study the bias of the observer. New methods of measuring currents were compared with

the standard dye packet method. A copy of the standard LEO observer sheet is included as a reference for the type of information collected (Figure 12).

LITTORAL ENVIRONMENT OBSERVATIONS
RECORD ALL DATA CAREFULLY AND LEGIBLY

SITE NUMBERS | YEAR | MONTH | DAY | TIME — Record time using the 24 hour system

WAVE PERIOD
Record the time in seconds for eleven (11) wave crests to pass a stationary point. If calm record 0

BREAKER HEIGHT
Record the best estimate of the average wave height to the nearest tenth of a foot

WAVE ANGLE AT BREAKER
Record to the nearest degree the direction the waves are coming from using the protractor on the reverse side. 0 if calm

WAVE TYPE
0 - Calm
1 - Spilling
2 - Plunging
3 - Surging
4 - Spill / Plunge

WIND SPEED
Record wind speed to the nearest mph. If calm record 0

WIND DIRECTION - Direction the wind is coming from
1-N 2-NE 3-E 4-SE 5-S 6-SW 7-W 8-NW 0-Calm

FORESHORE SLOPE
Record foreshore slope to the nearest degree

WIDTH OF SURF ZONE
Estimate in feet the distance from shore to breakers, if calm record 0.

LONGSHORE CURRENT

DYE
Estimate distance in feet from shoreline to point of dye injection

CURRENT SPEED
Measure in feet the distance the dye patch is observed to move during a one (1) minute period. If no longshore movement record 0

CURRENT DIRECTION
0 No longshore movement
+1 Dye moves toward right
-1 Dye moves toward left

RIP CURRENTS
If rip currents are present, indicate spacing (feet). If spacing is irregular estimate average spacing. If no rips record 0.

BEACH CUSPS
If cusps are present, indicate spacing (feet). If spacing is irregular estimate average spacing. If no cusps record 0

PLEASE PRINT:

SITE NAME | OBSERVER

Please Check The Form For Completeness

REMARKS:

CERC 113-72
8 Mar 72

Make any additional remarks, computations or sketches on the reverse side of this form.

Figure 12. Littoral Environment Observations (LEO) form

PART IV: STORM WAVE STUDIES

42. These 13 studies were conducted during October when the wave energy was, as expected, significantly higher than in September. The nearshore morphology on 6 October is shown in Figure 13. The nearshore bar, though still

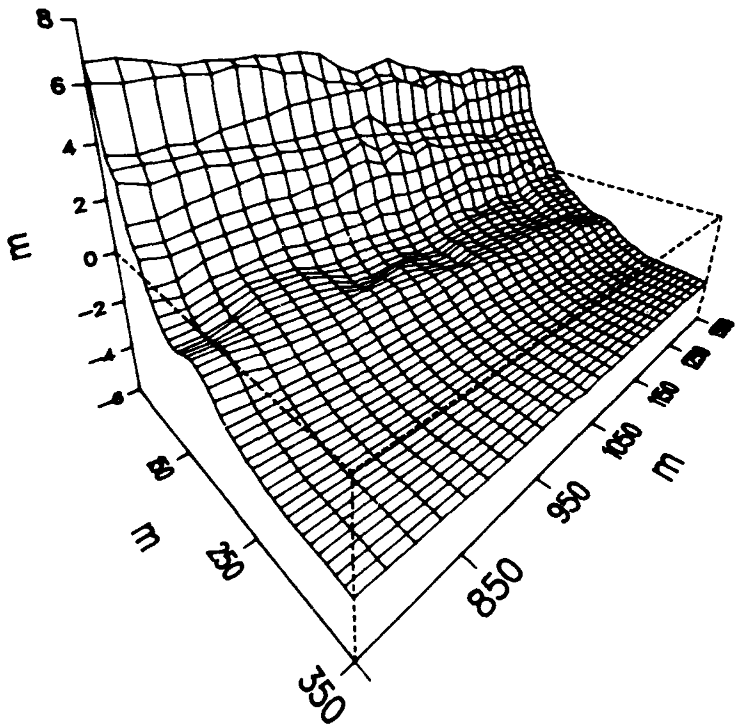

Figure 13. Minigrid bathymetry, 6 October 1986

complex, was milder than it was on 4 September (Figure 6). During October two large northeasters were monitored. The first and largest storm began on 10 October soon after the instrument installation was completed. Figure 14 shows the general climatic and sea state conditions for October. Table 10 lists daily observations that supplement the automated data collection.

43. The storm wave phase of SUPERDUCK was the most demanding in terms of instruments deployed, surveys conducted, and time series data collected. Locations of the experiments are shown in Figure 2.

Infragravity Wave Climatology

44. Principal investigators were Messrs. Peter A. Howd and William A. Birkemeier of CERC's FRF and Dr. Joan Oltman-Shay of Oregon State University.

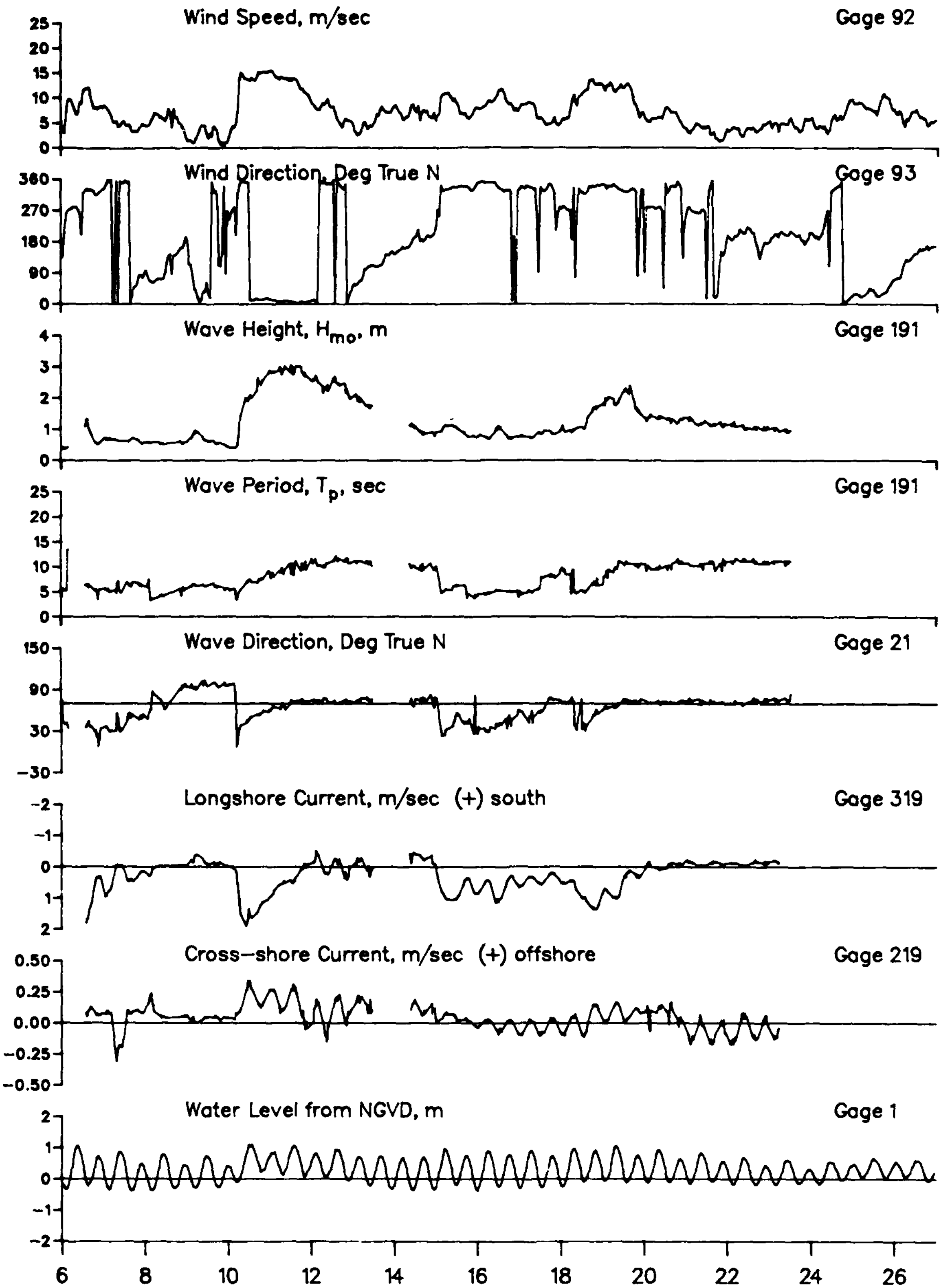

Figure 14. General conditions for October 1986

Table 10

FRF Supplemental Observations October 1986

Day	Time	Wave Approach Angle at Pier End deg from True N Primary	Wave Approach Angle at Pier End deg from True N Secondary	Radar Wave Angle deg from True N	Width of Surf Zone, m	Water Characteristics at Pier End Temp. °C	Water Characteristics at Pier End Density g/cc	Water Characteristics at Pier End Secchi Vis., m
1	0700	120			43	22.0	1.0224	1.2
2	0800	100			24	21.5	1.0226	1.5
3	0845	none visible			20	23.2	1.0220	1.8
4	0835	none visible			6	21.3	1.0222	2.7
5	0730	none visible			6	21.0	1.0230	4.3
6	0805	15			23	20.9	1.0229	2.4
7	0610	20			61	20.6	1.0230	0.9
8	0700	90			76	21.4	1.0233	1.8
9	0635	95			64	21.7	1.0220	7.0
10	0656	45		50	171	21.8	1.0222	0.9
11	0740	60			498	20.1	1.0213	0.0
12	0841	90	75		317	20.2	1.0204	0.6
13	0703	90	80		223	20.5	1.0204	0.3
14	0650	90	75		91	21.0	1.0220	0.3
15	0637	30	40		119	20.5	1.0225	0.3
16	0622	50			104	19.2	1.0227	0.6
17	0615	20			79	18.1	1.0222	0.6
18	0905	40	65	65	82	17.8	1.0212	0.6
19	0845	60	30		250	16.8	1.0212	0.6
20	0720	40	70		107	17.3	1.0220	0.3
21	0637	80	55		99	17.0	1.0218	0.3
22	0633	80		80	81	17.3	1.0224	0.6
23	0840	105			72	18.2	1.0228	0.9
24	0730	90			61	18.0	1.0232	0.9
25	0805	45	60	60	177	18.2	1.0230	0.6
26	0906	90	80		88	18.2	1.0230	0.6
27	0740	100		90	79	18.3	1.0230	0.9
28	0731	80		80	69	18.0	1.0232	0.6
29	0708	90			41	17.8	1.0230	2.4
30	0712	100			43	17.6	1.0227	1.2
31	0800	50			291	17.3	1.0227	0.6

Objective

45. The objective was to study the infragravity wave climatology, addressing (a) the relative importance of trapped (edge wave) and leaky modes, (b) their generation via the nonlinear interactions of the incident wind wave field and (c) infragravity wave relationship to nearshore bathymetry.

Experiment plan

46. A longshore array of 10 Marsh McBirney electromagnetic current meters located in the surf zone was operational from 6-23 October. The array was designed to measure the longshore wave number spectrum of the infragravity wave energy.

Data analysis

47. Thorough analysis of the infragravity wave content was crucial if the objectives were to be met. Both the surf zone current meter array and the

video runup array (discussed under Infragravity Wave Dynamics) were deployed at the SUPERDUCK field site to aid in this effort. Analysis methods applied to these array data will depend on their infragravity wave content. The wave field may be purely progressive, longshore-standing, or mixed. All waves may be equally present, or the field may be dominated by a few modes. Because the surf zone and video runup arrays view the infragravity wave field from different perspectives, the success of an analysis method may differ between arrays for the same infragravity field.

48. The investigators suspect that the content of the infragravity energy will differ from simple, plane beaches because of the many hypotheses (linking infragravity waves to complex beach morphology) that suggest preferential amplification of discrete infragravity frequencies and modes on a barred beach or the generation of bars in response to a narrow infragravity energy peak. Any observed structure (a peak) in the infragravity band could be the result of actual preferential forcing offshore by the incident wind waves through resonant tuning by the bar under broad-banded wind wave forcing.

49. The offshore wind wave directional array (discussed under Linear Array Wave Gage in Part V) will aid in discerning the broad or narrow band nature of the infragravity wave forcing. In addition, the sequence of high and low tide data runs presented an opportunity to look specifically at the response of the infragravity waves to the various cross-shore locations of the bar.

50. Preliminary analysis of the current meter data in the longshore array indicates tidal dependence on the magnitude of both the cross-shore and longshore mean currents in the surf zone. In addition, large oscillations in both of the current components with periods of 5 to 10 min were frequently observed. The longshore array will permit examination of both the temporal and spatial characteristics of these currents.

51. The longshore current meter data set was greatly enhanced by the data obtained by other surf zone experimenters. The status of the longshore gages throughout their collection life is given in Appendix A.

Nearshore Profile Response

52. Principal investigators were Dr. Asbury H. Sallenger and Mr. Bruce E. Jaffe of the US Geological Survey (USGS).

Objectives

53. The objectives were to (a) develop an all-weather capability to nearshore profile response and (b) relate observed profile changes during storms to waves and currents.

Experiment plan

54. Seven pressure and seven sonar gages (Table 1) were installed along the cross-shore array shown in Figure 2. The USGS supplied a battery of microcomputers to collect data and provide near real-time analysis of the changes in the cross-shore profile. The FRF VAX-750 and NOVA-4 were used as backup to collect the data on varying time schedules.

Data collection schedule

55. The USGS data acquisition system began data collection on 2 October 86 (1900 EST) and continued until 17 October 86 (1500 EST). The only interruptions were as follows:

Time, EST	Date	Reason
0600 - 1800	3 Oct 86	Instrument calibration
0600 - 0700	4 Oct 86	Program error
1400 - 1900	4 Oct 86	Adjustments
0800 - 1800	5 OCT 86	Testing
1300 - 1400	6 Oct 86	Program error
2200 - 0600	10 Oct 86	Computer crash
0800 - 0900	11 Oct 86	Program error
0000 - 0700	13 Oct 86	Computer crash

56. The data were collected at a sampling rate of 2 Hz for a period of 2,048 sec. Sonar and pressure gages (CS05, CS06, CS07) were disconnected intermittently between 8 October 86 (1100 EST) and 9 October 86 (1700 EST). Pressure gage CS07 had a diaphragm problem and provided questionable data.

Infragravity Wave Dynamics

57. Principal investigator was Dr. Robert A. Holman of Oregon State University.

Objectives

58. The objectives were to study (a) infragravity wave climatology, (b) relative importance of trapped waves (edge waves) versus leaky modes, and (c) interaction of infragravity waves with nearshore morphology. In addition, data were taken which will allow testing of a particular model for the forcing

of infragravity waves. Remote sensing techniques were used to collect all the appropriate data.

Experiment plan

59. An extensive set of video data under a variety of wave conditions was collected. Four-hour runup records centered at high and low tides were recorded during daylight hours from 1 October to 16 October, looking both to the north and south of the pier. Short time exposure records were recorded (approximately hourly) over the period of 28 September to 16 October. These were predominantly northward oriented with some southward facing data collected sporadically. Southward-facing time exposures will also be available from the longer runup runs. A listing of all data runs is included in Tables 11 and 12 (some data were lost, particularly on 10 October).

Data analysis

60. Analysis will follow three lines. First, time exposures will be made and rectified views computed. These will be compared to the CRAB data for verification. The morphology evolution will be charted with one emphasis being bar response and another being transverse bars in the trough.

61. Second, the runup data from which statistics will be taken will be digitized as a function of longshore location, but the primary emphasis will be calculating frequency-wave number spectra for studying infragravity band. This analysis is parallel to the longshore current meter array.

62. Third, the data will be analyzed to monitor surf zone width fluctuations as a rough parameterization of infragravity band forcing. Again, frequency-wave number analysis will be used.

Wind and Wind Wave Forcing of Mean Nearshore Currents

63. Principal investigators were Dr. Edward B. Thornton and CDR Dennis J. Whitford, United States Navy, Naval Postgraduate School.

Objectives

64. Objectives were to (a) examine the spatial variability of the bed shear stress coefficient at a barred beach and (b) calculate the relative importance of wind and wave forcing of nearshore currents.

Experiment plan

65. Instrumentation mounted on a sled was designed to measure the local momentum balance and the vertical distribution of mean currents in the near-

Table 11

Morphology Time Exposures

Date	Time	Duration	View	Tide	Tape
28 Sep 86	1336	0:15	N	Mid-High	GD001
	1345	0:15	N	Mid	GD001
	1400	0:15	N	Mid	GD001
29 Sep 86	1318	0:15	N	Mid	GD001
	1335	0:15	S	Mid	GD001
30 Sep 86	1045	0:15	N	Mid	GD001
	1100	0:15	S	Mid	GD001
	1725	0:15	N	Mid	GD002
	1730	0:15	S	Mid	GD002
1 Oct 86	1400	0:15	N	Mid	GD002
	1420	0:15	S	Mid	GD002
2 Oct 86	0908	0:15	N	Mid	GD002
	0928	0:15	S	Mid	GD002
	1213	0:15	N	Low	GD002
	1225	0:15	S	Low	GD002
	1527	0:15	N	High	GT008
	1548	0:15	S	Mid	GT008
3 Oct 86	1310	0:15	N	Low	GT008
4 Oct 86	1340	0:15	N	Low	GT008
5 Oct 86	0100	0:15	N	Low	GT008
	1745	0:15	N	Mid	GT008
6 Oct 86	0615	0:15	N	Mid-High	GD015
	1338	0:15	N	Low	GD015
	1430	0:16	N	Low	GD015
	1530	0:16	N	Low-Mid	GD015
	1630	0:16	N	Mid	GD015
	1730	0:16	N	High	GD015
7 Oct 86	0730	0:16	N	Mid-High	GH031
	0830	0:16	N	High	GH031
	0930	0:16	N	High	GH031
	1030	0:16	N	High	GH031
	1130	0:16	N	High-Mid	GH031
	1230	0:16	N	Mid	GH031
	1330	0:16	N	Mid	GH031
	1430	0:16	N	Mid-Low	GH031
	1530	0:16	N	Low	GH031
	1630	0:16	N	Low	GH031
8 Oct 86	0900	0:16	N	High	erased
	0930	0:22	N	High	erased
	1030	0:16	N	High	erased
	1130	0:16	N	High-Mid	erased
	1230	0:16	N	Mid	GH041
	1330	0:16	N	Low	GH041
	1330	0:16	N	Mid-Low	GH041
	1451	0:16	N	Low	GH041
	1640	0:16	N	Mid	GH041
	1730	0:16	N	Low	GH041
	1748	0:32	N	Low	GH041
9 Oct 86	0600	0:16	N	Mid	GH041
	0700	0:16	N	Mid	GH041
	0800	0:16	N	Mid-High	GH041
	0900	0:16	N	High	GH041
	1000	0:16	N	High	GH041
	1100	0:16	N	High	GH054
	1200	0:16	N	High	GH054
	1300	0:16	N	High-Mid	GH054
	1400	0:16	N	Mid	GH054
	1500	0:16	N	Mid	GH054
	1600	0:16	N	Mid-Low	GH054
	1700	0:16	N	Low	GH054
10 Oct 86	0600	0:16	N	Low-Mid	GH062
	0700	0:16	N	Low-Mid	GH062
	0800	0:16	N	Mid	GH062
	0900	0:16	N	Mid-High	GH062
	1000	0:16	N	High	GH062
	1100	0:16	N	High	GH062
	1200	0:16	N	High	GH062
	1300	0:16	N	High-Mid	GH062
	1400	0:16	N	Mid	GH062
	1500	0:16	N	Mid	GH062
	1600	0:16	N	Mid	GH062
	1652	0:31	N	Mid-Low	GH072
	0930	0:15	S	Mid	GT061
	1000	0:16	S	Low-Mid	GT061
	1100	0:16	S	High	GT061
	1200	0:16	S	High	GT061
	1300	0:16	S	High	GT061
10 Oct 86	1400	0:16	S	High	GT061
	1500	0:16	S	High-Mid	GT061
	1600	0:16	S	Mid	GT061
	1700	0:16	S	Low	GT061
11 Oct 86	0620	0:36	N	Low	GH072
	0700	0:20	N	Low	GH072
	0900	0:20	N	Mid	GH072
	1000	0:20	N	Mid	GH072
	1100	0:20	N	Mid	GH072
	1200	0:20	N	Mid-High	GH072
	1300	0:20	N	High	GH083
	1400	0:20	N	High	GH083
	1500	0:20	N	High	GH083
	1600	0:20	N	High-Mid	GH083
	1700	0:20	N	Mid	GH083
	0900	0:20	S	Mid	GT073
	1710	0:20	S	Mid	GT073
12 Oct 86	0600	0:20	N	Mid	GH083
	0700	0:20	N	Low	GH083
	0800	0:20	N	Low-Mid	GH083
	0900	0:20	N	Mid	GH083
	1000	0:20	N	Low	GH096
	1100	0:20	N	Mid	GH096
	1200	0:20	N	Mid	GH096
	1300	0:20	N	High	GH096
	1400	0:20	N	High	GH096
	1500	0:20	N	Mid	GH096
	1600	0:20	N	Mid	GH096
	1700	0:20	N	Low	GH096
13 Oct 86	1400	0:20	N	Low	GH096
	0600	0:20	N	Mid	GH096
	0706	0:20	N	Mid	GH111
	0800	0:20	N	Low	GH111
	0900	0:20	N	Low	GH111
	1000	0:20	N	Low	GH111
	1100	0:20	N	Low-Mid	GH111
	1200	0:20	N	Mid	GH111
	1300	0:20	N	Mid	GH111
	1400	0:20	N	Mid-High	GH111
	1520	0:20	N	High	GH111
	1600	0:20	N	High	GH121
	1700	0:20	N	High	GH121
	0900	0:20	N	High	UMATIC
14 Oct 86	0607	0:20	N	High	GH121
	0700	0:20	N	High-Mid	GH121
	0800	0:20	N	Mid	GH121
	0900	0:20	N	Low	GH121
	1000	0:20	N	Low	GH121
	1100	0:20	N	Low	GH121
	1200	0:20	N	Low	GH121
	1300	0:20	N	Mid	GH129
	1400	0:20	N	High	GH129
	1500	0:20	N	High	GH129
	1600	0:20	N	High	GH129
	1700	0:20	N	Mid	GH129
15 Oct 86	1000	0:20	N	Low	GH129
	1120	0:20	N	Low	GH129
	1205	0:20	N	Low	GH129
	1300	0:20	N	Mid	GH129
	1415	0:20	N	Mid	GH138
	1507	0:20	N	Mid	GH138
	1600	0:20	N	Mid	GH138
	1730	0:20	N	Mid-High	GH138
16 Oct 86	0600	0:20	N	High	GH138
	0700	0:20	N	High	GH138
	0800	0:20	N	High-Mid	GH138
	0900	0:20	N	Mid	GH138
	1000	0:20	N	Mid	GH138
	1100	0:20	N	Low	GH145
	1200	0:20	N	Low	GH145
	1300	0:20	N	Low-Mid	GH145
	1400	0:20	N	Mid	GH145
	1500	0:20	N	Mid	GH145
	1600	0:20	N	High	GH145
	1700	0:20	N	High	GH145
17 Oct 86	0635	0:20	N	High	GH145
	0700	0:20	N	High	GH145

Table 12

SUPERDUCK Runup Video Runs

Date	Time	Duration	Tide	Tape
1 Oct 86	1008	1:50	low	GD003
	1008	1:50	low	GM004
	1008	1:50	low	GT005
2 Oct 86	1113	1:50	low	GD006
	1113	1:10	low	GM007
	1529	1:10	mid	GD009
	1529	1:10	mid	GM010
3 Oct 86	0755	1:10	high	GD011
	0755	3:00	high	GH013
	0755	4:00	High	GT012
5 Oct 86	0925	3:00	high	GM014
6 Oct 86	0805	1:55	high	GD016
	0805	1:55	high	GM017
	0805	1:55	high	GT018
	1005	1:55	mid	GD019
	1005	1:55	mid	GM020
	1005	1:55	mid	GT021
	1303	1:55	LOW	GD022
	1303	1:55	low	GM023
	1303	1:55	low	GT024
	1505	1:55	low	GD025
	1505	1:55	low	GM026
	1505	1:55	low	GT027
7 Oct 86	0730	1:55	high	GD028
	0730	1:55	high	GM029
	0730	1:55	high	GT030
	0930	1:55	high	GD032
	0930	1:55	high	GM033
	0930	1:55	high	GT034
	1300	1:55	mid	GD035
	1300	1:55	mid	GM036
	1300	1:55	mid	GT037
	1500	1:55	low	GD038
	1500	1:55	low	GM039
	1500	1:55	low	GT040
8 Oct 86	0904	1:55	high	GD042
	0904	1:5	high	GM043
	0904	1:55	high	GT044
	1104	1:55	high	GD045
	1104	1:55	high	GM046
	1104	1:55	high	GT047
9 Oct 86	0929	1:55	high	GT050
	0930	1:55	high	GD048
	0930	1:55	high	GM049
	1129	1:56	high	GT053
	1130	1:56	high	GD051
	1130	1:56	high	GM052
10 Oct 86	0734	1:55	low	GD055
	0734	1:55	low	GM056
	0734	1:55	low	GT057
	0934	1:56	mid	GD058
	0934	1:56	mid	GM059
	0934	1:57	mid	GT060
	1147	1:55	high	GD063
	1147	1:55	high	GM064
	1147	1:55	high	GT065
	1347	1:56	high	GD066
	1347	1:56	high	GM067
	1347	1:55	high	GT068
	1546	1:56	mid	GT071
	1547	1:55	mid	GD069
	1547	1:55	mid	GM070
11 Oct 86	0805	1:56	low	GD074
	0805	1:56	low	GM075
	0805	1:55	low	GT076
11 Oct 86	1004	1:55	mid	GT079
	1005	1:56	mid	GD077
	1005	1:56	mid	GM078
	1204	1:56	high	GT082
	1205	3:56	high	GD080
	1205	1:56	high	GM081
	1404	1:56	high	GT085
	1405	1:56	high	GM084
	1410	1:50	high	GD086
	1604	1:55	high	GT088
	1605	1:56	high	GM087
12 Oct 86	0736	1:45	low	GD090
	0736	1:44	low	GM091
	0736	1:44	low	GT092
	0929	1:55	mid	GM094
	0929	35:0	mid	GT095
	0930	1:56	mid	GD089
	0930	1:56	mid	GD093
	1134	1:56	mid	GM098
	1135	1:56	mid	GD096
	1135	1:57	mid	GD097
	1335	1:55	high	GM100
	1335	1:55	high	GT099
	1535	1:56	mid	GM102
	1535	1:56	mid	GT103
	1536	1:55	mid	GD101
13 Oct 86	0600	1:55	mid	GD104
	0745	1:55	low	GD105
	0745	1:55	low	GM106
	0745	1:55	low	GT107
	0948	1:50	low	GD108
	0948	1:50	low	GM109
	0948	1:50	low	GT110
	1145	1:56	low	GD112
	1145	1:56	low	GM113
	1145	1:56	low	GT114
	1350	1:55	mid	GD115
	1350	1:55	mid	GM116
	1350	1:55	mid	GT117
	1553	1:55	high	GD118
	1553	1:55	high	GM119
	1553	1:55	high	GT120
14 Oct 86	0800	0:25	mid	GW122
	0922	1:55	low	GD123
	0922	1:55	low	GM124
	0922	1:55	low	GT125
	1124	0:51	low	GD126
	1124	0:51	low	GM127
	1124	0:52	low	GT128
	1528	1:55	high	GM130
15 Oct 86	1000	0:10	low	GD131
	1025	1:55	low	GD132
	1025	1:55	low	GM133
	1025	1:55	low	GT134
	1225	1:55	low	GD135
	1225	1:55	low	GM136
	1225	1:55	low	GT137
	1426	1:55	mid	GD139
	1426	1:55	mid	GM140
	1426	1:55	mid	GT141
16 Oct 86	1020	1:55	low	GD142
	1020	1:55	low	GM143
	1020	1:55	low	GT144
	1221	1:55	low	GD146
	1221	1:55	low	GM147

shore (Figures 15 and 16). The sled's orientation was accurate to within less than 0.5 deg, as determined by Zeiss shots on two spatially separated prisms on a mast spreader. Also, the sled's mobility was used to study rip currents.

Figure 15. Base of instrumented sled

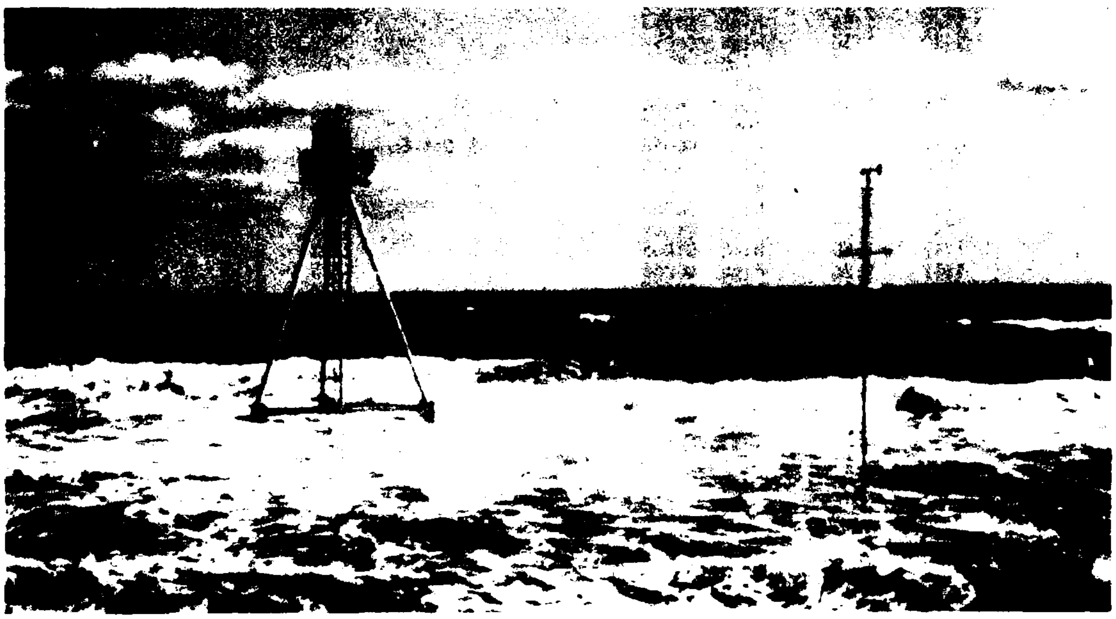

Figure 16. CRAB towing sled to experiment site

66. By numerically orienting the sled normal to the local bathymetric contours, the complete longshore momentum equation is

$$\frac{\partial M_y}{\partial t} + \frac{\partial \tilde{S}_{yx}}{\partial x} = -\tau_{by} + \tau_{\eta y} - \frac{\partial S''_{yx}}{\partial x}$$

Term: 1 2 3 4 5

where a right-handed Cartesian system is adopted with x increasing offshore, and

term 1 = temporal change of the time-averaged depth-integrated mean momentum per unit area in the longshore direction due to both steady ($\bar{M}_y$) and unsteady flow (M_y')

term 2 = on-offshore gradient of the wave-induced longshore momentum flux (also called the radiation stress gradient)

term 3 = bottom shear stress modeled as

$$-\tau_{by} = \overline{\rho C_f (u^2+v^2)^{1/2} v}$$

term 4 = wind-driven surface shear stress

$$\tau_{\eta y} = \overline{\rho_a C_d |W| W^y}$$

term 5 = on-offshore gradient of the longshore momentum flux due to turbulence.

As used in terms 3 and 4, where ρ and ρ_a are water and atmospheric densities, u and v are current velocities in the x and y directions, C_f is a bed shear stress coefficient, C_d is a stability-dependent atmospheric drag coefficient, W is wind speed, and the overbar denotes time-averaging.

67. Two differential pressure slope arrays and an absolute pressure reference were used to measure the wave-induced radiation stress gradient. Marsh McBirney electromagnetic current meters located at the centroid of the slope arrays were used to measure the total radiation stress gradient. A mast-mounted anemometer was used to measure wind stress. A stability-dependent atmospheric drag coefficient was determined from simultaneous wind stress measurements taken at the end of the FRF pier by Dr. Sethu Raman (NC State University). The vertical structure of the mean currents was measured using three currents at various elevations mounted on the sled. Assuming temporal

stationarity, the distribution of mean currents and wave energy across the surf zone was determined by moving the sled. Longshore array current meters were used as a reference for stationarity considerations.

Data collection schedule

68. Data collection using the current meters and an absolute pressure sensor commenced 11 October 86; and data collection, including the slope arrays, commenced 15 October 86. Sled transects were made near profile lines 197, 240, and 250. The data runs were at least 35 min in duration and were acquired at three to five different locations along a transect, commencing just seaward of the breaker zone of the inner bar. Data were acquired during daylight hours coinciding with the VAX collection times.

69. Prior to selecting an area of the surf zone to transect, the previous day's bathymetry was studied and changes in morphology noted. The area with the highest degree of straight-and-parallel isobaths was selected for each day's operations. Observations of waves breaking on the sled mast were marked by an electrical trigger which registered a pulse on the data tapes.

Data analysis

70. Data analysis will examine the following:

a. Momentum balance. Determine spatial variability of C_f and relative importance of wind and wave forcing.

b. Vertical distribution of radiation stress. The vertical distribution of radiation stress is important to recent theories on vertical current distribution and "undertow".

c. Vertical mean current structure across a nearshore bar. Data were acquired offshore, on top of, and inshore of the bar on all nearshore transects. It may be hypothesized that primary morphological changes are caused by mean current "events".

d. Anatomy of a rip current. The vertical structure of the mean cross-shore and longshore currents within a rip current were measured by transecting the rip current longitudinally on 12 October.

e. Unsteadiness of nearshore currents, such as pulsating rip currents. Unsteadiness of the currents may be correlated with wave groups or supercritical head of water within the nearshore bar or other mechanisms.

f. Wave height distribution over a nearshore bar.

g. Breaking wave height probability distributions. The probability density functions (pdf) could be utilized to verify the "whiteness" of the remotely sensed breaking wave data.

h. Comparison of radiation stress calculated by refracting the offshore directional spectra with the measured nearshore values on the sled.

i. Integration of the sled's anemometer data (generally within 3 m above NGVD) with the wind profile data acquired by NC State University's vertical wind profile (which lacked a wind sensor near the sea surface).

Momentum Balance and Surface Slope

71. Principal investigators were Dr. Guy A. Meadows and Ms. Lorelle A. Meadows of the University of Michigan and Dr. Lee L. Weishar of CERC.

Objective

72. The objective was to determine the longshore and cross-shore momentum balance throughout the nearshore region. This determination of the longshore momentum balance was based upon preliminary work conducted as part of the DUCK85 experiment and utilizes hydrodynamic observations throughout the coastal boundary layer to formulate the distribution of momentum outside and inside the surf zone. Results from the DUCK85 experiment showed that the dominant terms in the longshore momentum balance outside the surf zone were longshore pressure gradient and wind stress terms. Although important, bottom stress is secondary compared to wind stress and longshore pressure gradient force. Inside the surf zone and through the refraction zone these forces are still important, but bottom stress and wave radiation force are comparable to them. In both regions, momentum advection, Coriolis, and acceleration terms were small compared to the other terms in the momentum balance. These observations are consistent with results of the Coastal Boundary Layer Experiment (LEX81) conducted in Lake Erie in 1981.

Experiment plan

73. From knowledge gained during the DUCK85 experiment, several improvements were made to the field deployment scheme to enhance the SUPERDUCK data collection and analysis efforts. DUCK85 results showed that in examining the nearshore momentum balance, large quantities of momentum could reside in very subtle longshore pressure gradients. Therefore, great care was taken to

accurately measure the longshore gradient in sea surface elevation and to assess its contribution to the longshore momentum balance in this region. Figure 17 shows this gradient (as measured in 1985) using three pressure sensors; one located near the FRF pier, one located at Kitty Hawk pier, and one located at Avalon pier, approximately 10.2 and 17.3 km south of the FRF pier, respectively. To improve upon this configuration in SUPERDUCK, four pressure gages were deployed in 6.7 m (22 ft) of water in a region extending from 6 km north to 10 km south of the FRF pier. These pressure sensors were

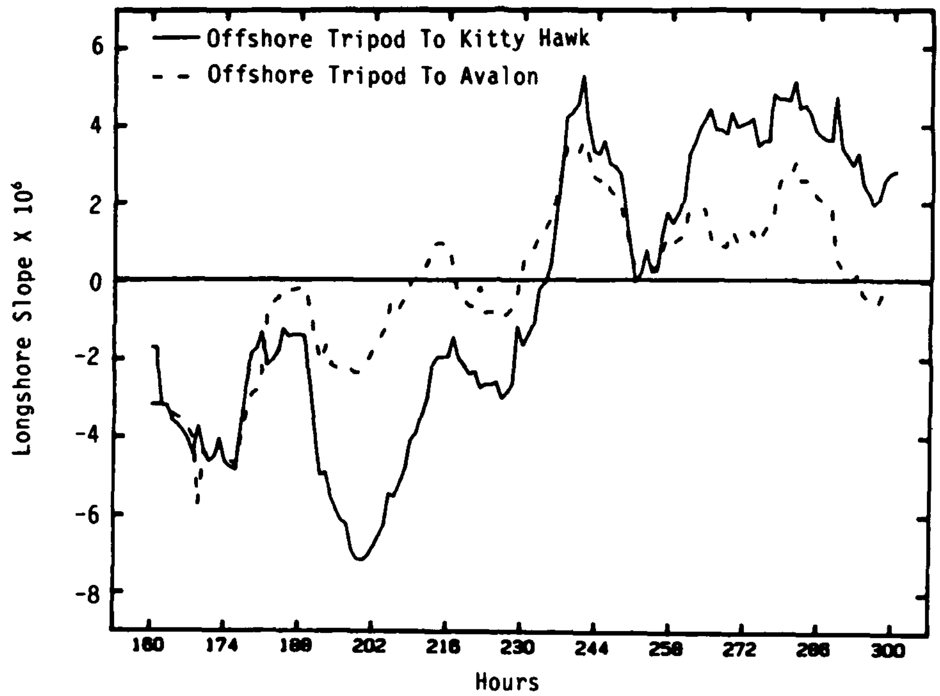

Figure 17. Time-averaged and digitally filtered longshore water elevation slopes between experiment site and Kitty Hawk pier and experiment site and Avalon pier (data from DUCK85)

dynamically leveled and routinely releveled during the experiment to assure a high level of accuracy in this measurement. To measure the other factors contributing to the nearshore momentum balance, two instrumented tripods were deployed in 6.7 and 11.6 m (22 and 38 ft) of water. Each tripod contained an electromagnetic current meter and pressure sensor (PUV) to determine incident directional wave spectra and near-bottom current velocities.

Data collection schedule

74. Data from these sensors were recorded by a newly developed portable automated data acquisition system consisting of a data concentrator located at each tripod and a portable Compaq 286 computer and Alloy 59 megabyte tape drive for mass data storage. Over 500 37-min time series of data sampled at 5 Hz were collected for each sensor.

75. To complete the momentum balance computation across the coastal boundary layer, a suite of other surf zone and nearshore instruments was also deployed as part of the SUPERDUCK experiment.

Data analysis

76. The data analysis will focus on the computation of the nearshore momentum balance inside and outside of the surf zone. Contributions from the longshore pressure gradient, first- and second-order wave radiation stress, wind stress, bottom stress, and longshore current acceleration will be considered as well as residual terms which may arise.

Inner-Shelf Dynamics: Process Measurements

77. Principal investigators were Dr. Lee L. Weishar of CERC, Dr. Guy A. Meadows and Ms. Lorelle A. Meadows of the University of Michigan.

Objective

78. This study was undertaken to quantify sediment transport seaward of the breaker zone by obtaining a combination of direct and indirect process measurements. These measurements consisted of waves, currents, and suspended sediment concentrations outside the surf zone on the inner shelf. This experiment was part of a larger overall effort to quantify the dominant processes responsible for transporting sediment outside the surf zone. The overall objective was to identify and then quantify the processes responsible for sediment resuspension events through a comprehensive series of measurements in the inner-shelf region. In addition, the effects of water depth and sediment size were examined by obtaining process and suspended sediment concentration measurements at the two locations (depths of 6.7 and 11.6 m).

Experiment plan

79. Two field efforts were embarked upon to determine relationships between the incident processes and resulting resuspension of sediment in the inner-shelf region. The first experiment involved the deployment of two

bottom-mounted tripods containing a PUV wave and current meter and a stacked array of OBS gages (Figure 18). Each OBS gage measured concentrations of suspended sediment as a function of elevation above the bed. Vertical spacing of the individual sensors is presented below.

Sensor	Height Above the Bottom
1	5.0 cm
2	5.5 cm
3	25.1 cm
4	50.1 cm
5	105.0 cm

80. The second experiment involved an unsuccessful attempt to measure vertical current structure. Five electromagnetic current meters were rigged to a sled mast and towed out to the 11.6-m site just prior to the onset of a northeaster. The current meter data were telemetered back to shore via a VHF transmitter. Unfortunately, the northeaster was one of the most severe that has occurred on the Outer Banks in the past several years. The sea state progressed from flat calm to a fully arisen state in approximately 4 hrs. The subsurface forces on the sled were so great that the rigging on the mast failed, preventing data from being telemetered to shore.

Data collection schedule

81. Data from each instrument were fed into a data concentrator located on the tripod. Next, the analog signals were digitized in the concentrator, multiplexed, amplified, and transmitted to shore through a single conductor. Then these data were routed to a PC-based data acquisition system where the signals were demultiplexed and stored in individual files of raw pressure, U- and V-current velocity, and suspended sediment concentration values. A synopsis of the data collected using this newly-developed portable data acquisition system is contained in Table 13.

Data analysis

82. The analysis of these data will provide a better understanding of the effects of various combinations of incident surface wave energy and subsurface currents on resuspension events. It also will provide a better data set to examine the effects of sea surface slopes and infragravity waves on sediment transport which were shown in DUCK85 to be an important factor in the inner-shelf region.

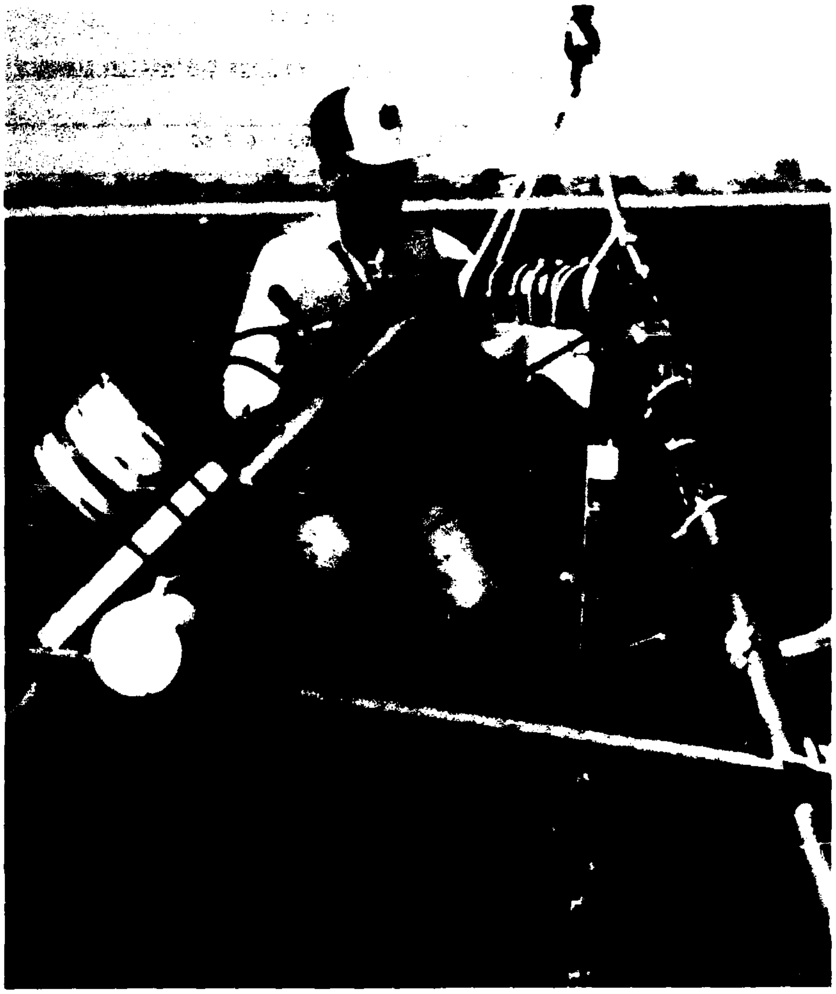

Figure 18. Instrumented tripod being deployed

Inner-Shelf Dynamics: DARTS II

83. Principal investigators were Dr. Guy A. Meadows and Ms. Lorelle A. Meadows from the University of Michigan, and Dr. Lee L. Weishar and Ms. M. Leslie Fields of CERC.

84. The Digital Automated Radar Tracking System (DARTS-II) is a prototype portable radar tracking system designed to obtain directional wave number spectra measurements from the breaker zone up to 4 km offshore. This system is an extension of the DARTS-I system used for automated tracking of current drogues released in restricted inlets.

Table 13

Inner Shelf Dynamics, Process Data Collection Summary

Inshore Tripod (-6.7 m)

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Time, EST																							
6 Oct																*	*	*	*	*	*	*	*	*
7 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
8 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*
9 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 Oct	*	*							*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*							
14 Oct											*	*	*	*	*	*	*	*	*					
15 Oct								*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*
17 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*					
20 Oct								*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
24 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
25 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
26 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
27 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
28 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
29 Oct	*	*	*	*	*	*	*	*	*	*														

Offshore Tripod (-11.6 m)

Date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Time, EST																							
4 Oct														*	*	*	*							
5 Oct														*	*	*	*	*	*	*	*	*	*	*
6 Oct	*	*	*	*	*	*	*	*	*		*	*	*	*			*	*	*	*	*	*	*	*
7 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
8 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*					
9 Oct	*								*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*							
14 Oct	*										*	*	*	*		*	*	*	*					
15 Oct	*							*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21 Oct	*	*	*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*
22 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
24 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
25 Oct						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
26 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
27 Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*					
28 Oct									*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
29 Oct	*								*	*	*	*												

85. The major components of the DARTS system are a digital raster scan radar with a built-in video interface, a video monitor, and a portable AT computer with frame grabber digitizing peripheral board. A small generator may be used to power the system; however, during the SUPERDUCK experiment, shore power was provided.

Objectives

86. The objectives were to determine the operational limits of the system, i.e. under which atmospheric and wave conditions it will obtain useful data, and to evaluate the DARTS-II remote sensing system using the comparative data obtained from a number of other wave-measuring devices.

87. In processing the DARTS-II data, the digitized radar signal is accessed in a region of interest (offshore, nearshore, or inshore) along the direction of wave approach. A spatial series of 1,024 sea surface radar return intensities is preprocessed with a 10 percent cosine taper on 50 percent overlapping segments and 3 lines averaged per band. A quasi-two-dimensional (2-D) (wave number spectra versus direction) Fast Fourier Transform (FFT) is then performed on the data in the direction of wave approach yielding a wave number spectrum. Representative DARTS-II wave number spectrum is provided in Figure 19.

Data collection schedule

88. Table 14 shows the dates and times of DARTS-II data acquisition. The prevailing conditions were videotaped along with the video radar output during all data sessions.

Data analysis

89. A full 2-D FFT is under development and will be applied to the twice daily DARTS-II data collected during SUPERDUCK. Comparisons of DARTS-II wave number spectra with conventional wave energy spectra from in situ point gages will be made. The DARTS-II system will be fully evaluated in terms of providing a rapid, reliable, and inexpensive means for measuring incident wave characteristics for coastal engineering applications.

Foreshore Sedimentation Processes

90. Principal investigators were Dr. Suzette M. Kimball (formerly with CERC) of the Virginia Institute of Marine Science (VIMS), Mr. Bruce E. Jaffe of the USGS, and Mr. Mark R. Byrnes of CERC.

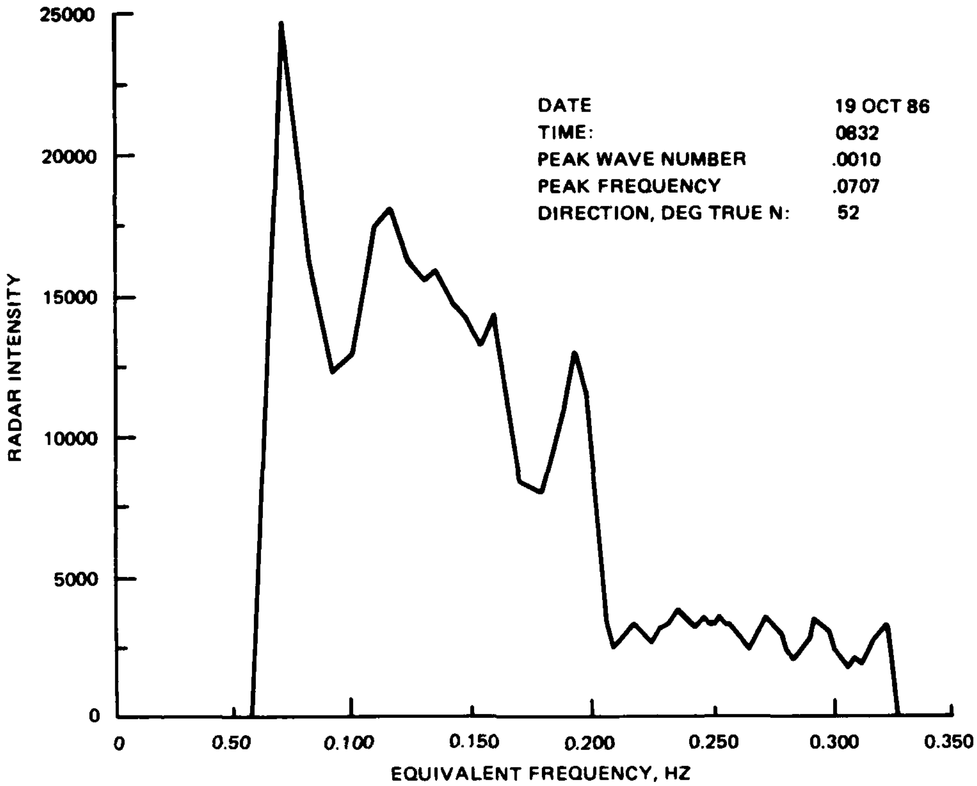

Figure 19. Sample DARTS-II wave number spectrum

Table 14

DARTS-II Operation Summary

Date	Time, EST	Date	Time, EST
3 Oct	1407	16 Oct	1000
4 Oct	0909	17 Oct	0945
6 Oct	1503		1155
10 Oct	0747		1530
	1046	19 Oct	0832
	1329	20 Oct	0715
12 Oct	0755	21 Oct	1322
	1312	22 Oct	1117
13 Oct	0710	23 Oct	1348
14 Oct	0717	24 Oct	1246
15 Oct	0717	25 Oct	1745
	1520		

Objective

91. As originally conceived, the objective was to develop a 3-D model of nearshore morphological and sedimentological variations in response to high-energy conditions. Specific elements to be evaluated during the period included:

a. Sediment sorting processes alongshore and cross-shore.

b. Relationships between textural variations and incipient morphological changes.

c. Delineation of longshore and offshore sources of sediment in the nearshore.

d. Evaluation of fine structures with larger scale morphological features (i.e. bars).

e. Evaluation of mesoscale bedforms in the inner trough.

f. Evaluation of coarse-grained deposits and their control over morphological development.

92. Based on an evaluation of events that occurred during the DUCK85 storm event, the experimental objectives were redefined to focus on the evolution of foreshore morphology and foreshore sedimentation patterns during and following a series of high-energy episodes.

Experiment plan

93. Initial experimental design included the collection of 18 short cores along profile lines 275, 250, and 230 (Figure 2) at high and low tides. An integral factor in the collection of the nearshore samples was the consistent functioning of the Remotely Operated Sediment Coring system (ROSCO), a portable coring device developed by CERC. During preexperiment test runs, the reliability of ROSCO offshore under high-energy conditions did not meet the minimum requirements for proper execution of the experiment. The experiment was rescaled to use hand-emplaced cores as the principal and supplementary means of data collection supplemented with the ROSCO system.

Data collection schedule

94. Data were collected using the following sampling layout:

Location	Profile Number 270	260	255	250	245	240	240a	235	230	N. Prop*
Storm berm	R	R	R	R	H	H/R	H	H	H	H
Upper swash	R	R	R	R		R				
Mid-swash	R	R	R	R	H	H/R	H	H	H	H
Step	R	R	R	R	H	H/R	H	H	H	H

Note: R- ROSCO system.
H- Hand driven.
* North property line (see Figure 2).

95. The study used bathymetric profiles surveyed by the CRAB, shallow cores obtained by ROSCO, and numerous hand cores. Table 15 lists the sample collection times. During each sample run, foreshore profiles were collected using a prism rod and Zeiss total electronic surveying station, and the upper swash limit was mapped. Samples were collected at both high and low tides during the 10 October storm and subsequent recovery period and at low tides for the remainder of the experiment.

Table 15

Foreshore Profile and Sediment Sampling Schedule

Date	Survey Time, EST	No. of Samples Recovered Foreshore	ROSCO
7 Oct	1400		22
10 Oct	0900		
	1830	3	
11 Oct	0900	18	
	1430		
	1820		
12 Oct	1100	15	16
	1700		
13 Oct	0945	18	18
	1700		
14 Oct	1045	18	16
	1700		
15 Oct	1145	19	
	1450		4
16 Oct	1515	18	
17 Oct	1340	18	
18 Oct	1400	18	
19 Oct	1500	18	4
20 Oct	1600	18	5
21 Oct	1600	18	
22 Oct	1630	18	

Data analysis

96. All cores were split, photographed, described, and subsampled according to visible depositional units. The 530 subsamples that were extracted will be mechanically sieved. Next, sand fractions will be analyzed with a Rapid Sediment Analyzer (RSA) to determine their hydraulic characteristics. The mineralogies will be established. Then, these data will be combined with the foreshore profiles to determine the sequences of morphologic and sedimentologic development. Finally, wave and current data from other experiments will be used to evaluate foreshore evolution under given energy conditions.

Sedimentary Micro Structures

97. Principal investigator was Dr. Curt D. Peterson of Oregon State University.

Objective

98. The objective was to test the hypothesis that the microstratigraphic criteria can be used to establish mechanisms and environments of deposition from nearshore sediment cores. Depending on the grain density relations, it should be possible to discriminate between planar stratigraphic deposition by (a) settling from a suspension event (normal grading), (b) selective entrainment from fluid shear (critical shear stress equivalence), and (c) grain shear sorting from grain flow (dispersive pressure equivalence).

Experiment plan

99. The experiment was coordinated with the geomorphological study conducted by Dr. Suzette Kimball. Some cores were taken by hand across the surf zone and inner bar (along the cross-shore array) prior to and during the October storm.

Data analysis

100. Cores taken by hand and the ROSCO system were examined using a Hewlett-Packard sediment X-ray unit and a binocular microscope. Figure 20 is an X-radiograph of a core taken at the seaward end of the cross-shore array following the first day of the October storm. The core was taken in approximately 4 m of water, just offshore of the inner bar and was oriented alongshore. This was the full extent of the core because a gravel bed prevented further penetration. There was some slight disturbance in the upper part of the core as shown in the downturned sand laminae.

101. The radiograph shows:

a. Alternating layers of gravel and very coarse sand (core bottom) deposited by energetic nearshore currents following an initial scouring event.

b. Thin overlying laminae of heavy minerals, including magnetite (dark layers in core middle) concentrated by selective entrainment.

c. Finely striated laminations of light minerals deposited under high-flow regime, plane-bed conditions.

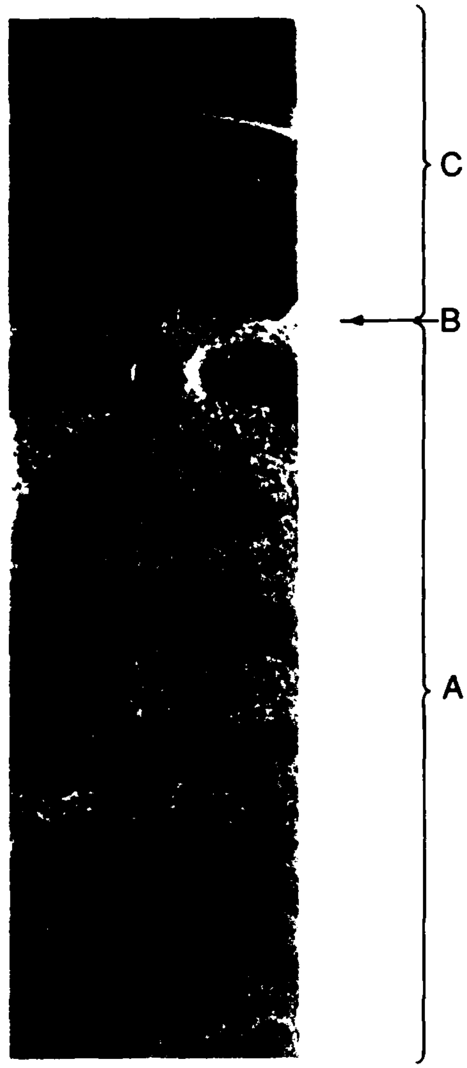

Figure 20. X-radiography of a core

102. This well-preserved core thus represents a partial storm sequence -- scour followed by gravel lag deposition, followed by heavy mineral lag deposition, followed by light mineral deposition -- during the course of transition from storm to waning storm conditions. Of particular interest is the regular alternation of gravel and coarse sand layers at the bottom of the core. At least six couplets can be counted, and these might indicate some periodic variation in nearshore current velocity during an early phase of the storm.

Similarly, there are several apparent couplets of light minerals and traces of heavy minerals in the plane-bed striated sands of the upper part of the core.

103. Interesting samples were impregnated with wax and taken back to the College of Oceanography to determine the mean intermediate grain diameter of quartz (density of 2.6) and magnetite (density of 5.2) using a petrographic microscope.

Effects of Coastal Processes on Sand-Dwelling Organisms

104. Principal investigators were Mr. Mark W. Denny and Ms. Lani A. West from the Hopkins Marine Station of Stanford University.

Objective

105. The objective was to gain improved understanding of the influences of physical coastal processes on sand-dwelling organisms.

Experiment plan

106. Surface sediment cores (11 x 3 cm) were collected cross-shore along the photopoles at the morning low tide from 8-16 October.

Data analysis

107. The surface sediment core samples will be analyzed by sorting interstitial organisms into taxonomic groups to quantify abundance and distribution of taxa before, during, and after storm conditions. The distributional patterns of organisms will be compared to the corresponding wave and current conditions. Organismal patterns will be correlated with grain size distribution of sand and sediment along the photopoles.

108. To test for patchiness or clumping in the distribution of organisms alongshore, 50 random points were sampled along a 50-m transect on each of two days (13 and 14 October). These transects were conducted in the swash zone directly inshore from the cross-shore array of current meters.

109. To document the vertical distribution of organisms at depths deeper than 11 cm, sand samples from Dr. Kimball's cores taken with ROSCO alongshore at low tide are being examined. Vertical distribution will be compared to Dr. Kimball's documentation of grain size and distribution.

Application of a Photographic System for Evaluation of Sediment Transport Using Fluorescent Tracers

110. Principal investigators were Ms. M. Leslie Fields and Dr. Lee L. Weishar of CERC.

Experiment plan

111. A study of sediment transport seaward of the surf zone was conducted using fluorescent tracer sands monitored with a benthic sediment profiling camera. The imaging system was originally developed in 1971 for in situ imaging of organism-sediment relationships on the ocean floor. The camera differs from conventional underwater cameras by its ability to make a vertical slice into the seafloor and to image the sediment-water interface in profile. The optical path of the system consists of air and distilled water so image quality is not affected by high water turbidity. A hydraulic piston controls the rate at which the optical prism vertically cuts through the bottom, thus minimizing disturbance of the sediment.

112. Application of the imaging system was expanded to include detection of sediment dispersion as a function of grain size and depth of sediment burial through ultraviolet imaging of fluorescent tracer sands. The original camera design was modified by the addition of two ultraviolet light sources placed inside the optical prism. A benthic profiling camera owned and operated by the Virginia Institute of Marine Science was used to collect the images during SUPERDUCK (Figure 21). Ektachrome ASA 400 slide film was used with the ultraviolet light source for maximum detection of the fluorescent particles. To provide information on bed roughness and sediment characteristics, images were also taken with Kodachrome ASA 25 film illuminated with a white light strobe.

Data collection schedule

113. Sediment profile images were taken on 9 October and 29 October within a 200- x 200-ft (61- x 61-m) grid which consisted of 16 sample stations spaced 50 ft (15 m) apart. The sample grids were located 4,400 to 5,070 ft (1,341 to 1,545 m) offshore in water depths of 38 to 40 ft (11 to 12 m). Wave and current conditions were provided by data collected on a nearby instrumented tripod described in the Inner Shelf Dynamics: Process Measurements experiment (paragraph 77).

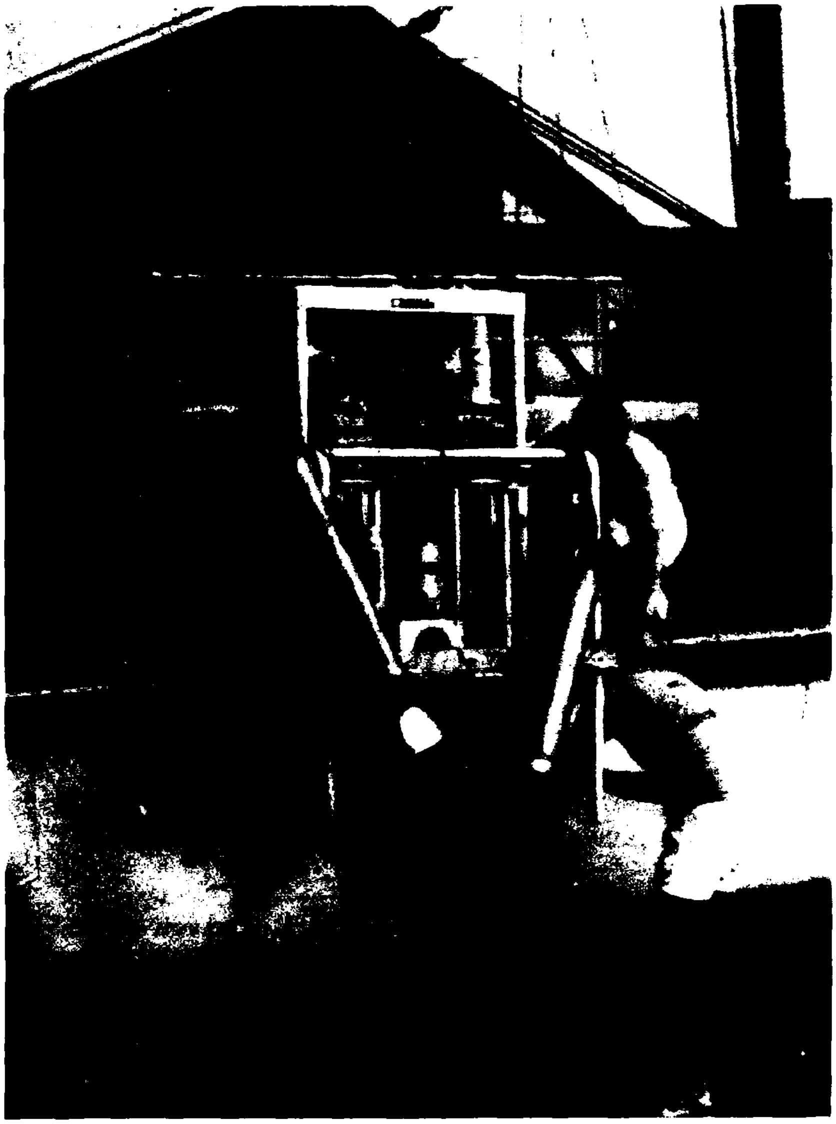

Figure 21. Benthic profiling camera

114. Fluorescent tracer material was deployed as a point source at the center of each grid and sampled using the benthic profiling system at time intervals that ranged from 22 to 28 hr after injection. The tracer consisted of three sizes of sediment with mean diameters of 0.44, 0.34, and 0.12 mm that were tagged with different fluorescent colors. A summary of the sediment profile imagery is presented in the following tabulation:

Date	Time, EST	Data Collection
8 Oct 86	1340	Fluorescent tracer deployment
9 Oct 86	1600-1730	Benthic profiling imagery - 16 Ektachrome ASA 400 images
28 Oct 86	1320	Fluorescent tracer deployment
29 Oct 86	1149-1320	Benthic profiling imagery - 22 Ektachrome ASA 400 images
	1607-1700	Benthic profiling imagery - 32 Kodachrome ASA 25 images

Data analysis

115. A computer image analysis will be conducted on each of the samples using an International Imaging System Model 75 image processor. The parameters to be evaluated from the sediment profile images include tracer concentration, depth of sediment burial, surface roughness, and sediment grain size and compaction. The data will be used to construct a series of tracer concentration contour plots necessary to determine sediment distribution patterns and dispersion rates as a function of grain size and wave and current processes. The experimental tracer distributions will be compared with theoretical distributions predicted by models of 2-D spreading from a point source.

Short-Term Disturbance Effects of Storms on the Subtidal Benthic Communities of Duck, North Carolina

116. Principal investigator was Mr. David A. Nelson of WES's Environmental Lab.

117. This study was conducted in cooperation with the "Application of a Photographic System for Evaluation of Sediment Transport using Fluorescent Tracers" study.

Objectives

118. The objectives were to assess the short-term effect of storms on the composition of the benthic community, demonstrate the effectiveness of combining physical and biological studies, and test the efficacy of using sediment profiling cameras in sandy substrates.

Experiment plan

119. Examination of the benthic community and sediment characteristic was conducted prestorm and poststorm. A Smith-McIntyre grab sampler was used to quantitatively sample the benthos, and a benthic profiling camera was used to qualitatively examine the benthos and effects of sediment disturbance.

Data collection schedule

120. Sediment profiling photos and corresponding benthic samples were taken along a transect perpendicular to the shoreline, beginning at a depth of 14 ft (4 m) (the shallowest depth at which sampling from a vessel could be conducted) and continued at 8-ft- (2.4-m-) depth intervals to a depth of 46 ft (14 m). This offshore depth was selected to represent a stable reference site because this was the shallowest depth at which sediment transport was unlikely during a storm of moderate strength. This station array was taken to represent a continuum of decreasing sediment disturbance effects on the benthic communities of the nearshore zone off Duck, North Carolina.

Preliminary Comments

121. Benthic samples were obtained only during the poststorm period. On 29 October three replicate Smith-McIntyre grab samples were taken at the five stations. Samples were sieved through a 0.5-mm sieve and then preserved with a 10 percent formalin solution and stained with rose bengal. In the laboratory, fauna were identified to family and counted.

122. Sediment profiling camera pictures were obtained during the prestorm and poststorm periods. On 9 October, one photo was taken at the five stations. On 29 October, the poststorm sampling date, five color photos were again taken at all five stations.

Data analysis

123. From computer analysis of the photos, the following data were obtained:

- a. Total image area.
- b. Anaerobic/aerobic layer area.
- c. Prism penetration (measure of compactness of sand).
- d. Surface roughness (relief).
- e. Depth of redox partial discontinuity (RPD).
- f. Depth of burial.
- g. Void area and number (indication of feeding activity).
- h. Burrow area and number of animal tubes.
- i. Shell area.
- j. Grain size (Udden-Wentworth scale).

k. Surface features.

l. Fauna.

m. Position of voids relative to other features.

Dune Erosion

124. Principal investigators were Drs. John S. Fisher and Margery F. Overton of North Carolina State University.

Objective

125. The objective was to define the processes and rates of dune erosion and the rates of sediment supply and transport in the swash zone.

Experiment plan

126. Two days of dune construction and erosion experiments were conducted during October (Figure 22). The site of the study was located in the swash zone, shoreward of the cross-shore array (see Figure 2).

Data analysis

127. From this information the investigators plan to derive important data related to shear stress and sediment load.

Figure 22. Construction of experimental dune

PART V: ALL-WEATHER STUDIES

128. All-weather studies were conducted during both September and October.

Offshore Material Placement

129. Principal investigators were Messrs. James E. Clausner and Edward B. Hands of CERC.

Objective

130. The objective of this experiment was to improve the ability to monitor and predict the response of dredged material placed seaward of the surf zone.

Experiment plan

131. The surf zone traps described in Part III were modified for use in deep water. First, the 1.8-m- (6-ft-) long streamers were shortened to 1.1 m (3.5 ft) to reduce the probability of the streamers becoming snarled around the traps and rigging. Second, one-way doors were placed at the trap openings to prevent sand which entered the trap from escaping when the current directions reversed. Finally, the traps were stabilized with 0.64-cm (1/4-in.) wire rope lines connected to 2.22-cm (7/8-in.) rebar anchors. Each trap had two anchors.

132. The traps were connected in a diamond pattern designed to have adjacent trap corners 4.3 m (14 ft) apart with 6.7 m (22 ft) separating opposite traps. These distances were thought to be a reasonable compromise between isolating the traps from each other and making installation practical by divers in moderate visibility.

133. Prior to installation, the sediment trap streamers were arranged vertically to give a roughly logarithmic spacing. During initial spacing, the distances on a single trap were measured; then the other streamers were installed on the remaining traps to give as close to the same spacing as possible to the original trap. After recovery, the spacing on all the traps was measured. Streamer spacing for the measured trap (T1) is shown in Table 16.

134. To simplify the underwater portion of the installation, all anchor lines, interconnecting lines, and streamers were rigged onshore and cable tied

to the trap frames prior to deployment. To verify that the design worked prior to the storm wave portion of SUPERDUCK and to take advantage of good weather, the traps were installed during the end of the nonstorm wave experiment from 24 to 30 September. Trap installation was sufficiently complicated that visibility of 3 m (10 ft) or more and low currents were a necessity.

Table 16

Elevations* of Streamers Above the Bottom During 24-30 Sep Deployment

Streamer No.	Elevation, cm
S7	90.6
S6	68.4
S5	48.4
S4	32.3
S3	18.1
S2	8.2
S1	1.3

* Water depth 11.6 m.

135. The traps were aligned with Trap 1 facing north. After the legs were pressed into the bottom, the anchor lines stretched out, and the 1.5-m- (5-ft-) long rebar anchors were driven 76 cm (30 in.) into the bottom. After Traps 2 and 4 were walked back to remove slack, Trap 3 was positioned to face south using two alignment cables. The anchor lines to Trap 3 were then installed. Following similar procedures, Traps 2 and 4 were also installed. Turnbuckles in the anchor lines and interconnecting lines were then adjusted to remove all slack. Finally, the streamers were unfurled.

136. To provide current data prior to the installation of the tripod at the 11.6-m (38-ft) site, three ENDECO 174 self-recording current meters were installed on a submerged mooring approximately 30 m (100 ft) east of the traps. The meters were located 1.8 m (6 ft), 4 m (13 ft), and 7 m (23 ft) above the bottom. Unfortunately, only meter A076 located 1.8 m (6 ft) above the bottom functioned correctly.

Data collection schedule

137. When the traps were checked on 26 September, no noticeable sand had accumulated in the traps. This is not surprising because no significant wave activity had taken place.

138. On 27 September the wind switched from the southwest to east northeast and increased to approximately 15 knots (10 m/sec) (Figure 7). Wave heights were estimated to be 1 to 1.4 m (3 to 4.5 ft). These conditions persisted through the 28th when the winds died down and shifted back to the southwest.

139. On 30 September the streamers were recovered. Streamers T3S6, T3S7, T4S6, and T2S5 had become untied. Some of these streamers had become tangled, probably because they had extended to their full 1.8-m (6-ft) length. The weight of the sand trapped by each streamer is presented in Table 17. Because four of the streamers had become untied, plastic cable ties were used to secure the ends of the streamers on the next deployment.

Table 17

Weight* of Sand Accumulated in Streamers 24-30 Sep 86

Streamer No.	Trap 1 (North)	Trap 2 (East)	Trap 3 (South)	Trap 4 (West)
S7	27	11	0	13
S6	10	11	3**	12**
S5	26	10†	3	16
S4	26	44	7	26
S3	58	250	9	160
S2	110	450	50	290
S1	210	900	40	140**

* Dry weight measured in grams.
** Streamer door was jammed shut upon delivery to laboratory.
† Streamer ends were open upon delivery to laboratory.

140. On 8 October the streamers were redeployed at the elevations given in Table 18. Comparison of these elevations with those in Table 16 shows that the streamers in Trap 1 were not reinstalled at the same elevation as on the earlier deployment because of the difficulty of installing the traps underwater with limited visibility. The depth of the scour holes under the traps was also measured. The scour holes under Traps 1, 2, 3, and 4 were 9, 6, 1, and 1 cm (0.3, 0.2, 0.04, and 0.04 ft), respectively. On 2 October a Sea Data 635-12 PUV gage that provided wave and current data was installed on the tripod at the 11.6-m (38-ft) site, approximately 30 m (100 ft) east (seaward) of the sediment traps (Figure 2). The current sensor on the gage was located approximately 15 cm (0.5 ft) above the sea bottom.

Table 18

Elevations* of Streamers Above the Bottom During 8-24 Oct Deployment

Streamer No.	Trap 1 (North)	Trap 2 (East)	Trap 3 (South)	Trap 4 (West)
S7	93.9	87.7	94.6	84.9
S6	71.1	69.2	70.5	66.7
S5	55.5	48.9	54.9	50.6
S3	40.0	28.9	35.6	35.3
S3	23.8	16.8	23.2	17.2
S2	14.3	5.1	11.7	6.4
S1	1.3	1.3	1.3	1.3

* Elevations (in centimeters) are to the center of the 2.54-cm streamer opening. Water depth was 11.6 m.

141. Problems with weather and equipment prevented recovery of the sediment traps until 25 October. In spite of large waves, the traps and anchoring system performed well.

Data analysis

142. While the length of deployment made calculation of the absolute sediment transport impossible, relative weights contained by the streamers listed in Table 19 give an indication of transport concentration at various elevations. Notably, the lower streamers had become so full that they were buried in the bottom. Some of the streamers did not function correctly, probably as a result of the one-way doors becoming jammed in the open or closed position for various lengths of time. Still two conclusions can

Table 19

Weight* of Sand Accumulated in Streamers 8-24 Oct 86

Streamer No.	Trap 1 (North)	Trap 2 (East)	Trap 3 (South)	Trap 4 (West)
S7	18	5	5	220
S6	30	17	4	1,000
S5	9	250	6	1,800
S4	110	140	25	5,600
S3	1,800	1,100	63	7,300
S2	5,400	2,000	340	2,000
S1	5,700	1,800	3,700	8,700

* Dry weight measured in grams.

immediately be drawn from the data. First, the major direction of sediment movement was offshore, as evidenced by the weight of sand trapped in the streamers of Trap 3. Second, the amount of sediment moving dropped off rapidly with elevation above the bottom for the traps facing north, south, and east. However, the traps facing west (onshore) had significant amounts (66.7 cm above the bottom) of sediment up to and including Streamer 5.

143. To provide data on bed elevation changes and the depth of disturbance (DOD) on the bed, reference rods were driven into the bottom at the 6.7- and 11.6-m (22- and 38-ft) sites. Four 2.2-cm- (7/8-in.-) diam stainless steel rods were installed at each site. Each 1.8-m- (6-ft-) long rod was driven approximately 0.9 m (3 ft) into the bottom and spaced approximately 1.5 m (5 ft) apart. A PVC "T", with a 0.6-m- (2-ft-) long cross piece was used to eliminate the effect of local scour craters around the rods when the elevation of the bed was measured. Tables 20 and 21 give bed elevation data from both the 6.7-m (22-ft) and 11.6-m (38-ft) site.

Table 20

Changes in Bed Elevations at the 22-ft (6.7 m) Site from DOD Rod Measurements*

Rod Number	24 Sep 86	1 Oct 86	Change	9 Oct 86	Change	Total Change
1	96.0	97.5	1.5	95.7	-1.8	-0.3
2	93.9	93.0	-0.9	93.0	0.0	-0.9
3	93.6	93.6	0.0	91.4	-2.2	-2.2
4	91.7	89.9	-1.8	89.6	-0.3	-2.1
Average Change			-0.3		-1.1	-1.4

* Elevations in cm.

144. On 9 October stainless steel washers were slipped over the rods and placed on the bottom. Eventually, measurements of the depth of the washer below the bottom will be measured to give an indication of the depth of the active layer.

Sea Scour

145. Principal investigator was Mr. John H. Lockhart, Jr. of the US Army Corps of Engineers.

Table 21

Changes in Bed Elevations at the 38-ft (11.6 m) Site from DOD Rod Measurements*

Rod Number	24 Sep 86	1 Oct 86	Change	9 Oct 86	Change	Total Change
1	89.6	86.0	-3.6	88.1	2.1	-1.5
2	93.0	90.5	-2.5	86.6	-3.9	-6.4
3	89.0	88.7	-0.3	89.0	0.3	0.0
4	89.9	89.0	-0.9	89.3	0.3	-0.6
Average Change			-1.8		-0.3	-2.1

* Elevations in cm.

Objective

146. The objective was to test applicability of a maximum scour depth determination method used in fluvial systems to the nearshore environment at the FRF. The study was intended to provide the Corps of Engineers with an economical method to determine the maximum erosion or scour experienced during a storm season or after a single storm.

Experiment plan

147. The study involved the installation of colored sand pipes at various depths and locations along the beach south of the FRF pier (see Figure 2). The sea scour concept is based upon the premise that if dyed sand cores are placed along a profile normal to the beach at precise locations, then it would be possible to determine the profile of maximum scour during any period of time by determining the elevation of the top of the dyed sand cores. The FRF's Zeiss survey system was vital in precisely locating the position of the dyed sand cores.

148. Several types of dyed sand and dye implantation methods were tried. The simplest and most successful method involved the washing of a 4- to 6-in.- (10- to 15-cm-) diam hole with a 4-in.- (10-cm-) PVC casing and a 1.5-in. (4-cm) lance. A 4-in. (10-cm) casing was advanced around the lance as water (approximately 100 gpm) was used to jet a hole (Figure 23). The casing prevented the hole from collapsing after the hole was complete and the lance removed.

149. Dyed sand was then poured down the casing as the casing was pulled out. The result was a 4- to 6-in. (10- to 15-cm) dyed sand pipe that extended

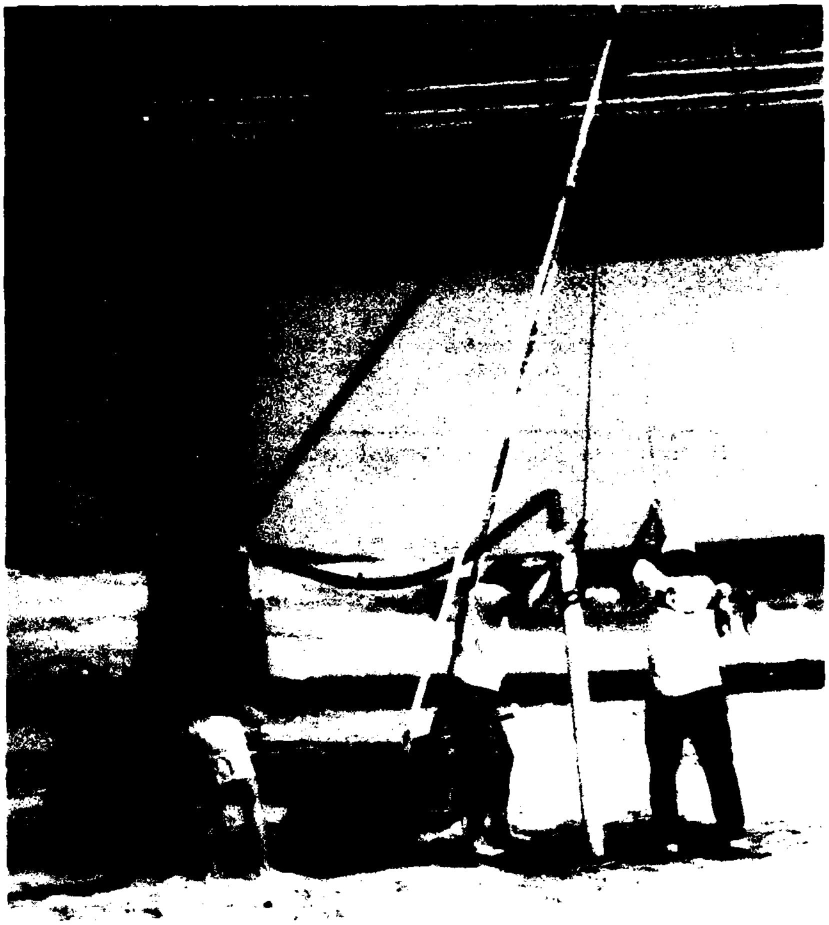

Figure 23. Installation of dyed sand pipe

from the surface to a depth of approximately 10 ft (3 m). Some of the sand pipes were dug out to determine the success of the installation. It was then discovered that liquid dye emplacement was not successful and that the larger the casing the more successful was the installation of predyed sand.

150. Figure 24 illustrates the method used to place the dyed sand in the washed hole. Table 22 lists the locations of dyed sand cores that have been successfully dug out to determine depth of maximum scour.

Seabed Drifters

151. Principal investigators were Messrs. Edward B. Hands and Darryl D. Bishop of CERC.

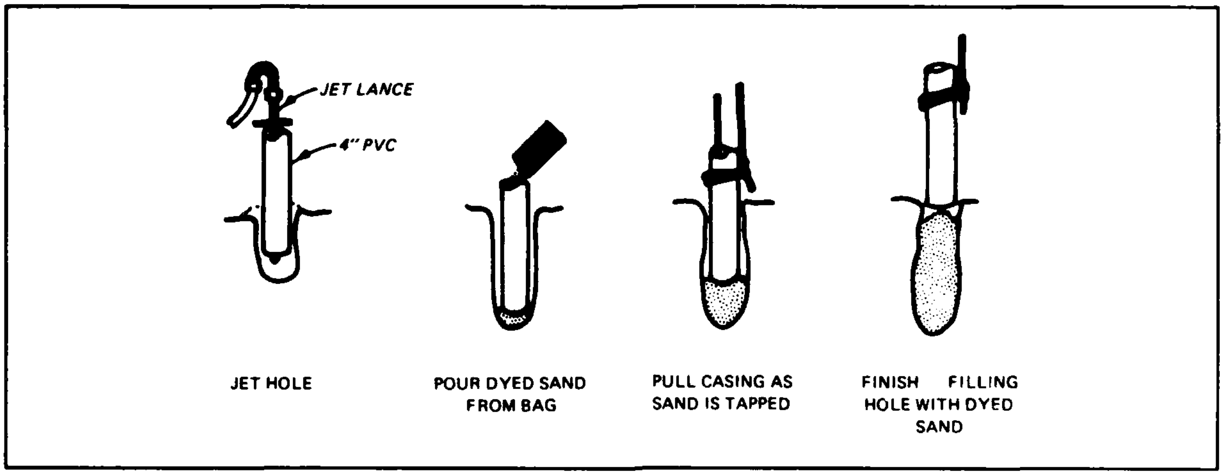

Figure 24. Method for the placement of dyed sand in a bore hole

Table 22

Locations of Dyed Sand Pipes*

X, Longshore, m	Y, Cross-Shore, m	Z, Elevation, m
1.26	115.30	.23
.51	105.75	1.19
2.04	90.32	2.07
2.43	75.51	2.90
90.70	120.87	.22
90.35	111.76	1.14
90.85	105.10	1.45
90.81	101.93	1.59
90.61	94.45	2.22
69.42	104.14	1.42
46.46	101.85	1.45

* Installed during week of 10 Aug 86.

Objective

152. The objective was to test the effectiveness of seabed drifters (SBD's) as indicators of nearshore current patterns.

Experiment plan

153. Two types of weighted drifters were deployed in varying water depths and varying sea conditions during September and October (Table 23).

Data collection schedule

154. The SBD's were collected along the beach as they washed ashore. The exact time and location were noted and compared with the known release times and locations to determine the rate and direction of drift. Special sound

Table 23

Preliminary SUPERDUCK Seabed Drifter Data

Drifter SN	Release Date	Release Time	Site*	Drifter Code**	Number Recovered†
4001 to 4025	11 SEP 86	1049	3 VIMS	YN	17
4026 to 4050	11 SEP 86	1037	4 WOT	YN	8
4051 to 4075	11 SEP 86	1040	1 PIER	YN	19
4076 TO 4100	11 SEP 86	1033	5 BB5	YN	13
4101 TO 4125	20 SEP 86	853	1 PIER	ON	17
4126 TO 4150	20 SEP 86	855	1 PIER	ON	24
4151 TO 4175	20 SEP 86	800	2 INNR	ON	18
4176 TO 4200	20 SEP 86	800	2 INNR	ON	18
4201 TO 4225	11 SEP 86	1049	3 VIMS	ON	24
4226 TO 4250	11 SEP 86	1040	1 PIER	ON	21
4251 TO 4275	20 SEP 86	826	3 VIMS	ON	23
4276 TO 4300	20 SEP 86	826	3 VIMS	ON	21
4301 TO 4325	19 SEP 86	1136	4 WOT	ON	19
4326 TO 4350	19 SEP 86	1136	4 WOT	ON	22
4351 TO 4375	24 SEP 86	1048	1 PIER	ON	22
4376 TO 4400	24 SEP 86	1053	2 INNR	ON	25
4401 TO 4425	24 SEP 86	1053	3 VIMS	ON	23
4426 TO 4450	24 SEP 86	1057	4 WOT	ON	19
4451 TO 4475	24 SEP 86	1057	4 WOT	ON	19
4476 TO 4500	24 SEP 86	1039	4 WOT	ON	21
4501 TO 4525	11 SEP 86	1033	5 BB5	ON	21
4526 TO 4550	11 SEP 86	1100	5 BB5	ON	21
4551 TO 4575	19 SEP 86	1100	5 BB5	ON	18
4576 TO 4600	19 SEP 86	1100	5 BB5	ON	18
4601 TO 4625	24 SEP 86	1100	5 BB5	ON	16
4626 TO 4650	24 SEP 86	1100	5 BB5	ON	23
4651 TO 4675	24 SEP 86	1108	6 RAD	ON	17
4676 TO 4700	24 SEP 86	1108	6 RAD	ON	16
4701 TO 4725	8 OCT 86	1310	1 PIER	ON	25
4726 TO 4750	8 OCT 86	1310	2 INNR	ON	24
4751 TO 4775	8 OCT 86	1303	3 VIMS	ON	18
4776 TO 4800	8 OCT 86	1340	4 WOT	ON	4
4801 TO 4825	8 OCT 86	1340	4 WOT	ON	5
4826 TO 4850	8 OCT 86	1121	5 BB5	ON	6
4851 TO 4875	8 OCT 86	1121	5 BB5	ON	4
4876 TO 4900	8 OCT 86	1130	6 RAD	ON	3
4901 TO 4925	8 OCT 86	1130	6 RAD	ON	6
4926 TO 4950	11 OCT 86	730	1 PIER	ON	22
4951 TO 4975	11 OCT 86	1517	1 PIER	ON	23
4976 TO 5000	12 OCT 86	723	1 PIER	ON	21
5001 TO 5025	12 OCT 86	1721	1 PIER	OU	12
5026 TO 5050	13 OCT 86	1415	4 LTD	OU	25
5051 TO 5075	12 OCT 86	1821	1 PIER	OU	24
5076 TO 5100	14 OCT 86	936	8 JSO	ON	10
5101 TO 5125	14 OCT 86	924	7 JSI	OU	24
5126 TO 5150	14 OCT 86	924	7 JSI	OU	20

* Site Code		Description	Local Coordinate, m Y	X	Z
1 PIER	-	East end of FRF pier	597	515	-7.9
2 INNR	-	Inner drop/Photopole Line	606	947	-6.4
3 VIMS	-	VIMS 8509 current meter	867	969	-7.9
4 WOT	-	Weishar's outer tripod	1360	1050	-11.6
5 BB5	-	Boundary buoy 5	1540	1140	-12.8
6 RAD	-	Outermost drop	1980	1040	-14.6
7 JSI	-	From RV John Smith	1460	1750	-11.6
8 JSO	-	From RV John Smith	2450	1550	-14.6

** Sea Bed Drifter Codes relate to Drifter type:
Y = Yellow, O = Orange, N = New, U = Used

† Number recovered out of 25 deployed

transmitters were attached to some of the SBD's. A hydrophone from the pier and a trawler were used in an attempt to develop a method of tracking the path between drifter release and recovery points.

Data analysis

155. The pattern of drift from the deployment sites will be compared with predicted and measured flow patterns made from a number of instruments deployed during SUPERDUCK.

Nearshore Wind Stress

156. Principal investigators were Drs. Jon M. Hubertz and Charles E. Long of CERC and Dr. Sethu Raman of North Carolina State University.

Objective

157. Time series of atmospheric temperature, humidity, and three components of wind speed would enable direct computation of turbulent fluxes of heat, water vapor, and momentum near the sea surface. Mean values of air temperature, water temperature, humidity, wind speed, and wind direction would serve as general climatological descriptors. All these measurements, in conjunction with sea state and current data provided by other investigators, would allow testing and, if necessary, modification of existing drag coefficient models for wind stress on the ocean surface. It is hypothesized that modification is necessary because existing models assume deep ocean conditions and do not account for differences in ocean dynamics which occur nearshore.

Experiment plan

158. Two sets of meteorological sensors were provided and installed at the seaward end of the FRF pier by personnel from North Carolina State University (Figure 25). One set of sensors consisted of robust, low-frequency response devices intended to provide stable estimates of mean air temperature, humidity, sea surface temperature, wind speed, and wind direction. These sensors were sampled at 5 Hz by a Campbell Scientific Model 21X data logger. Hourly mean values and variances were computed in real time and stored on audio cassette tapes. The data logger digital display and handheld instruments were used three times per day to ensure that these sensors were functioning properly.

159. The second set of sensors consisted of high-frequency response devices for measuring air velocity, temperature, and humidity. Velocity was measured with a three-axis impellor anemometer. Redundant horizontal speed measurement was made with a hot film anemometer, and redundant vertical velocity measurement was made with a single-axis sonic anemometer. A chromel

constantan thermocouple and a platinum wire resistance thermometer provided redundant measures of air temperature.

160. Humidity was dually measured by a thin film capacitor humidiometer and an optical absorption hygrometer. These devices were sampled at 10 Hz by a second Campbell data logger. Hourly means, variances, and all possible turbulent covariances were computed in real time and stored on audio cassette tape.

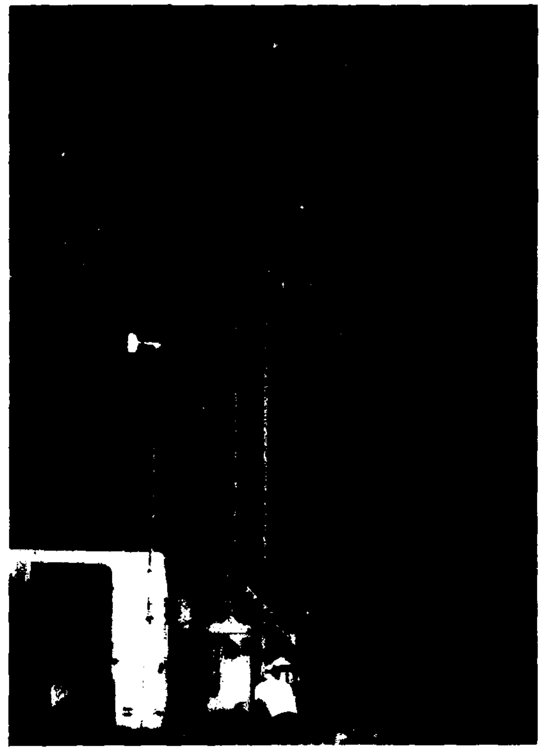

Figure 25. Meteorological instrumentation

Data collection schedule

161. To ensure that these devices were functioning properly, a 30-min time series of all channels was collected daily through a second program on the data logger. Data were collected from 7 September through 31 October.

Data analysis

162. The first step in analysis is editing and correcting the data. The redundancy in data collection allows intercomparisons to be made so that data of poor quality can be eliminated. Spectra of time series collected from the high-frequency devices will allow corrections to be made to flux estimates for the roughly 10 percent of variariance not resolved by the instruments at the higher frequencies. Anticipated results of this experiment will take the following forms:

a. A background report justifying the execution of this experiment.

b. A summary of the data from the low frequency instruments for those interested in mean climatology.

c. A summary of the flux estimates for those interested in the actual wind stress during SUPERDUCK.

d. An analysis of drag coefficient formulae using all the data in the context of equations given in the background report.

Marine Radar

163. Principal investigator was Dr. Dennis B. Trizna of the Naval Research Lab.

Objective

164. The objective was to study the capability of marine radar to determine various parameters of the wave field.

Experiment plan

165. The marine radar at the FRF was modified to allow collection of digitized samples of the video signal for offline analysis. This was the first time the collection hardware was used in a field experiment, and the results appear to be promising.

Data collection schedule

166. The data were collected with a density to allow for imaging of the incoming ocean waves from the shoreline to a range of the order of 2.5 km.

Data analysis

167. Because the image does not map linearly to a surface profile for low angles of radar illumination, wave height cannot be retrieved directly from the image. As a result of the lack of a theory to provide such a mapping at this time, analysis of 2-D image spectra reveals no root mean square (RMS) wave height information. At this point the primary analysis will be the generation of 2-D image power spectra with the peak wave numbers and directions determined for three different areas in the field coverage.

168. Three areas within a semicircle of 2.5-km radius are proposed for analysis: (a) a deepwater region at the farthest extent of radar coverage; (b) a region over the linear array, for comparison; and (c) a region south of the pier in shallow water where shoaling effects are apparent in radar imagery. The output will be values of wave length and direction for the dominant spectral peak and any swell apparent in the image. Planned data processing will be from the following dates and times:

Date	Time, EDT
10 Oct 86	0800, 1000, 1200, 1330, 1600, 1730
11 Oct 86	0800, 1000, 1100
12 Oct 86	0900, 1000
17 Oct 86	0800, 0930, 1130, 1330
18 Oct 86	0730, 1230, 1630

Coastal Ocean Dynamics Application Radar

169. Principal investigator was Mr. David B. Driver of CERC.

Objective

170. The objective was to measure waves and currents at distances of up to 40 km from the shoreline.

Experiment plan

171. The Coastal Ocean Dynamics Application Radar (CODAR) unit was installed in the radar trailer at the north end of the FRF property during early September. CODAR was operated on a 4-hr sampling schedule, collecting approximately one-half hour of data per sample period. An initial inspection of the data indicated that the unit did not properly record the data. The problem was fixed and 8 days of continuous data were recorded and analyzed beginning on 23 October. Comparisons with the 6-km Waverider showed good agreement for significant wave height and peak period.

Linear Array Wave Gage High-Resolution Directional Wave Array

172. Principal investigator was Dr. Joan M. Oltman-Shay of Oregon State University.

Objective

173. A linear wave array was designed and deployed to investigate the nature of the wave climate found along the Atlantic seaboard in the vicinity of Duck, North Carolina, and to provide complimentary data for other nearshore studies. Wind-generated surface gravity waves are a principal source of energy to oceanic coastlines. A complete description of the incident wave field requires well-resolved estimates of both frequency and directional spectra. Significant progress has been made in the design of spatial wave arrays and in the refinement of the associated analysis techniques (Davis and Regier 1977; Long and Hasselman 1979; Pawka 1982, 1983; Pawka et al. 1983, 1984). Spatial arrays provide the best resolved ocean wave directional spectra available. These arrays have demonstrated in the field the ability to resolve wave trains separated by 15 deg (Pawka 1983). Compact measurement systems such as pitch-and-roll buoy, the slope array, and PUV are logistically easier to deploy and maintain; however, using the most sophisticated analysis

methods available, they have not been able to resolve wave trains separated by less than 70 deg (Oltman-Shay and Guza 1984).

Experiment plan

174. A long-term offshore linear array of pressure sensors was constructed at the FRF for the purpose of acquiring high-resolution directional information of the locally incident wind wave field. It was installed in late August north of the pier (in 8-m water depth) parallel to the survey baseline and was in full operation by mid-September. This water depth was selected because of the need to measure relatively high-frequency waves known to be present at Duck. The linear array consisted of 10 pressure sensors with a maximum and minimum separation of 255 and 5 m, respectively (Table 1). The array sensors were configured to optimally measure the 0.06 to 0.3 Hz wind wave field. Because the incident wind wave field at Duck has the potential of being spatially inhomogeneous under certain conditions (esp. at lower wind frequencies), the array was designed to monitor the homogeneity of the wave field. If conditions presented an inhomogeneous wave field at lower frequencies, the linear array was to be inoperable at those frequencies. Therefore, a slope array which did not require spatial homogeneity was built into the array as a "fail safe". High wind wave frequencies were not anticipated to be spatially inhomogeneous.

Data collection schedule

175. This wave directional array is a long-term instrument/data acquisition system. The goal was to acquire high-resolution directional information from 2-hr records taken every 6 hr, except during storm conditions, at which time records were taken every 3 hr. Only data taken at 6-hr intervals were kept for the archives unless interesting wind wave conditions warranted more. The directional array provided for the first time high-resolution incident wind wave direction information coincident with a major nearshore field study.

Data analysis

176. Raw data from the directional array was available almost immediately after SUPERDUCK. Processed data will be available later.

177. The benefits of such a high resolution description of the offshore wind wave directional field are many. Immediate benefits will be to provide an important measurement useful to most of the SUPERDUCK experiments, including the shoaling wave transformation study, the surf zone width fluctuations

study, the long-wave generation study, and the evolving bathymetry studies. In addition, it provides the motivation for future nearshore investigations such as intensive mean flow current and sediment transport studies. Long-term benefits are a data base of high quality wind wave frequency and directional spectra for the central east coast.

Remote Acoustic Doppler Sensing System

178. Principal investigator was Mr. Gerald F. Appell of the National Oceanic and Atmospheric Administration's Ocean Systems Division.

Objective

179. The objective was to evaluate the near-surface measurement capability of a Remote Acoustic Doppler Sensing (RADS) system under various sea states.

Experiment plan

180. An RD Instruments model RD-SC 1200 Doppler current profiler (RD) was set up to transmit both a standard processed data stream and the doppler-shifted frequency data from two beams to a shore station. The frequency data were recorded on an analog tape recorder and will be digitized for analysis. The data will be compared to data collected at a nearby instrument tripod. The RADS was connected to an existing seven conductor cable located near Dr. Weishar's 38-ft (11.6-m) tripod (see Figure 2). Data collection began on 3 October. The instrument was oriented at approximately 45 deg west of north. Unfortunately, this was not the best orientation, and subsequent dives in the area did not afford the opportunity to reorient the instrument.

181. An anemometer and wind direction vane were erected at the end of the pier, and wind speed and direction were recorded simultaneously with RADS data.

182. When the dive team retrieved the RADS, they found the device covered up by sediment, with only the sensor and one half of the instrument package exposed above the sediment water interface. The dive team was unable to free the RADS by manually lifting, so they cut the main instrument package free from the sediment covered base.

Data analysis

183. Although some problems were experienced with the data acquisition system, the data collected during the experiment from the RD data stream have

been reduced and transferred onto LOTUS 1-2-3 spreadsheets. Some of these data, collected by the National Oceanic and Atmospheric Administration (NOAA), have been plotted-up and are presented in Figure 26.

Short Baseline Slope

184. Principal investigator was Dr. Michael E. Andrew, formerly with CERC.

Objectives

185. The short baseline slope experiment was intended to verify simulation results indicating that small slope arrays of high resolution quartz pressure sensors can provide accurate estimates of mean wave direction. The results of this experiment will provide the foundation for development of directional wave measurement technology that can survive longer deployments, is simple to calibrate, easy to protect from hazards such as trawler nets, and has improved data accuracy and reliability.

Experiment plan

186. The experiment consisted a 12-ft (3.7-m) right triangle slope array with nested 8- and 6-ft (2.4- and 1.8-m) slope arrays (Figures 27 and 28). The pressure sensors output frequencies in analog form. Each analog frequency signal was sampled 5 times per sec and converted to digital format at a concentrator on the gage. The multiplexed digital output was sent via armored cable to a microcomputer recording station inside the FRF building. The gage was sampled at the beginning of every hour for 37 min.

Data collection schedule

187. The gage was installed, and recording was started on 15 October 1986 at 0900 hours. Several days of data were lost during October because of hardware failure at the receiving station. Otherwise, the data set was complete.

Measurement of Long-Period Microseisms

188. Principal investigator was Mr. Kent K. Hathaway (formerly with the Florida Institute of Technology) of CERC.

Objectives

189. This study examined the relationship between microseismic activity and local ocean wave activity, with particular attention to the ocean wave

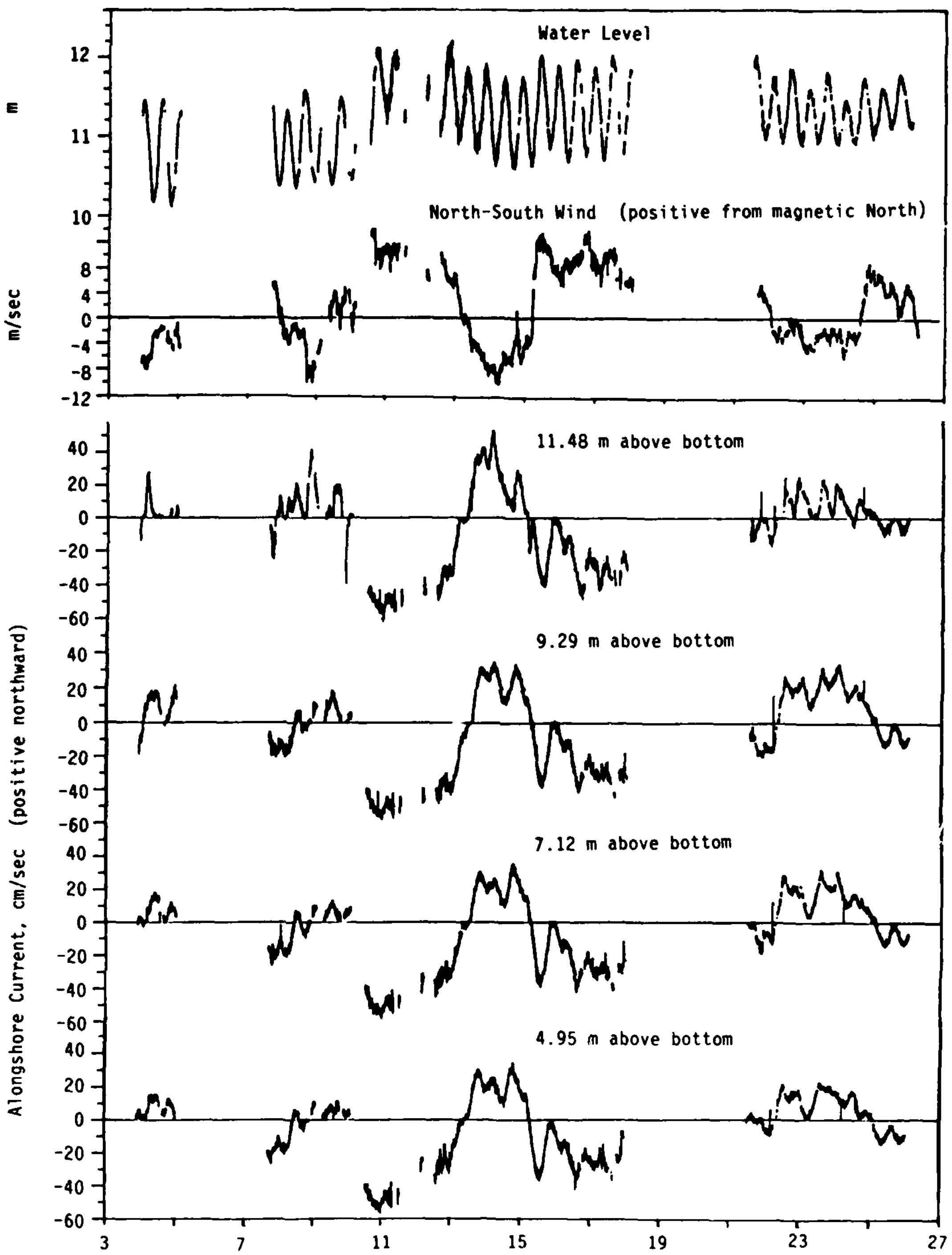

Figure 26. RADS data for October 1986

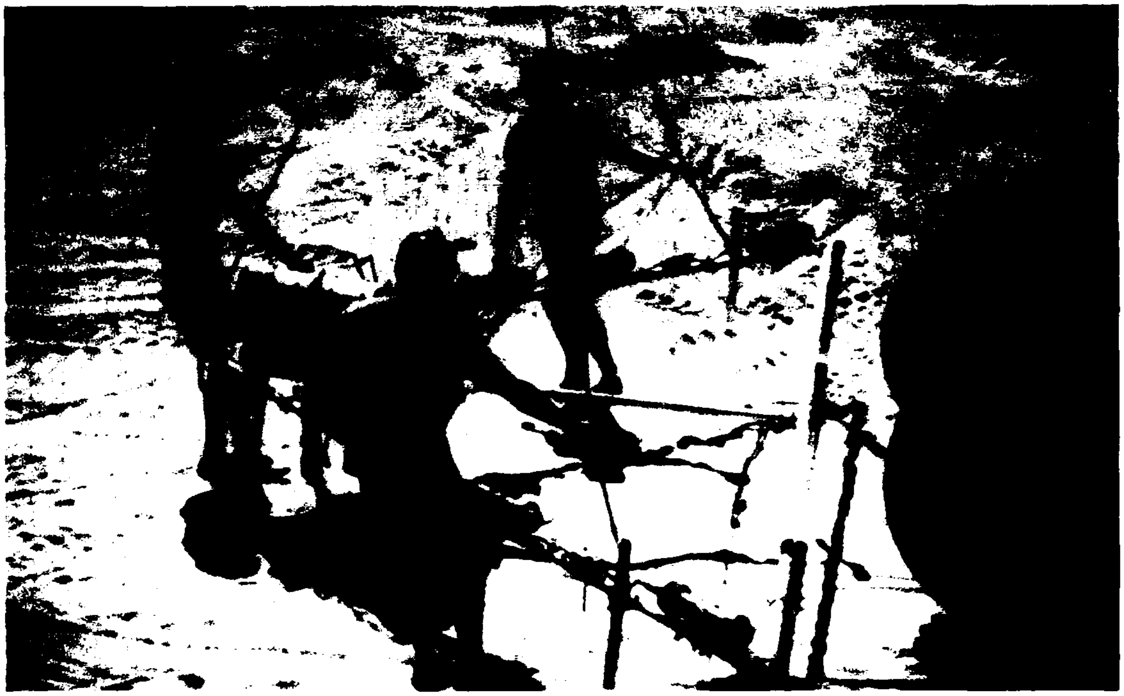

Figure 27. Slope array prior to deployment

height and direction determined from the south tripod data. Other considerations for microseismic production was the effect of ocean wave modifications as a result of beach slope, offshore bars, and tidal elevations. A previous investigation by Hathaway and Costa (1982) found significant heights deduced from microseismic records were correlated with tide heights (Figure 29). Wind fluctuations were also considered as a possible mechanism for microseismic generation.

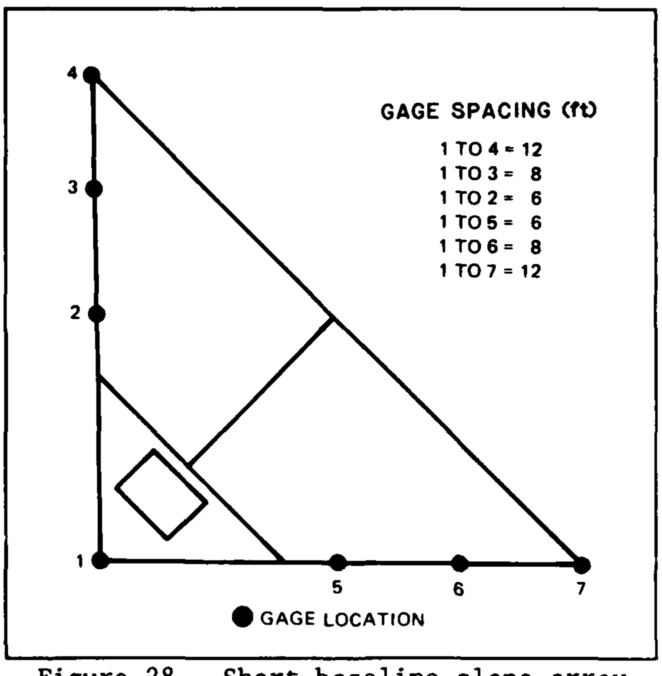

Figure 28. Short baseline slope array

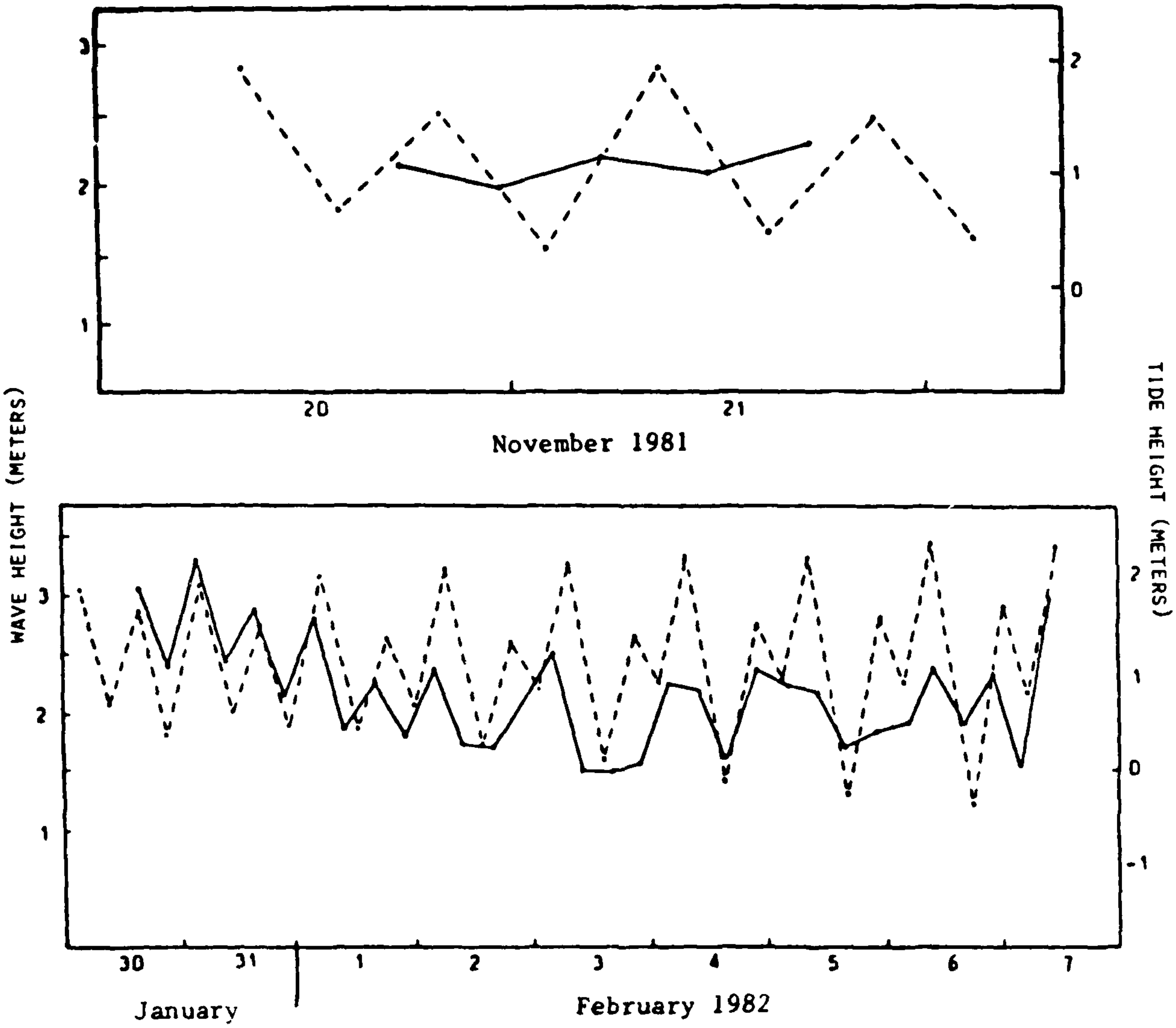

Figure 29. Plot of seismometer significant wave height (solid line) and tide height (dashed line) for Nov 1981 and Jan-Feb 1982 (from Hathaway and Costa 1982)

Experiment plan

190. Microseisms (Earth noises) are perceived as the continuous background noise recorded by seismometers. These noises are results of external influences from the atmosphere and the ocean. Any disturbance of the structure of the Earth will result, at least locally, in some degree of seismic activity. Although seismic noise has been recorded with periods ranging from 10^{-2} to 10^{+8} sec, the microseisms primarily discussed in literature have periods in the range of 2 to 20 sec and are associated with gravity wind waves.

The microseisms measured in this study, in the 2- to 20-sec range, propagate principally as Rayleigh waves with peak periods ranging from 3 to 8 sec and typical amplitudes of 1 to 10 microns.

191. Microseisms often have periods identical to those of the associated ocean waves, termed primary microseisms. However, microseisms are generally observed with periods half those of the ocean waves, termed secondary microseisms, and are believed due to nonlinear ocean wave-wave interactions of standing waves. Waves of this type can occur in a coastal region by reflecting off a steep coast or in the open ocean by intersection of oppositely moving wave trains of similar period. This experiment compared primary and secondary microseismic energy to the local ocean wave energy.

Data collection schedule

192. Long-period vertical microseisms were recorded in September and October 1986 during the SUPERDUCK experiment. The times of data collection are presented in Table 24. These microseisms were measured with a Teledyne Geotech long-period vertical seismometer which produced a signal that was digitized and recorded on an LNW-80 microcomputer. The seismometer and electronics were located in the FRF main building, and the recording computer was in the instrument trailer. Each seismic data set consisted of 4,096 points sampled at 2 Hz and was collected at times corresponding to the FRF data collection.

Data analysis

193. The data were transferred to the FRF VAX computer for analysis. Spectral analysis of the seismic data conforms to the FRF standard time series analysis, allowing a direct comparison to ocean wave gage spectra (e.g., coherence calculations). If possible, the primary and secondary microseismic energies are separated, usually when the corresponding ocean wave spectra are narrow banded and single peaked. The primary, secondary, and total seismic energies are analyzed separately for correlations with the ocean wave energy.

Improvement of Operational Surf Forecasts

194. Principal investigator was Dr. Marshall D. Earle of MEC Systems Corporation.

Objective

195. The objective was to test the real-time operation of a surf fore-

Table 24

Times of Microseismic Data Collection

Date	Time, EDT
13 Sep 86	1400, 1600, 1800, 2000, 2200
14 Sep 86	0000, 0200, 0400, 0600, 0800, 1000, 1700, 1900, 2100, 2300
15 Sep 86	0100, 0300, 0700, 0900, 1100, 1300, 1500, 1700, 1900, 2100, 2300
16 Sep 86	0100, 0300, 0500, 0700, 0900, 1400, 1600, 1800, 2000, 2200
17 Sep 86	0000, 0200, 0400, 0400, 0800, 1000, 1200, 1400, 1600
6 Oct 86	1730, 2000, 2300
7 Oct 86	0200, 0500, 0800, 1100, 1810, 2132
8 Oct 86	1702, 2312, 2346
9 Oct 86	0556, 1646
10 Oct 86	1210, 1301, 1600, 1800
11 Oct 86	1200, 1400, 1600, 1800, 2000, 2200
12 Oct 86	0000, 0200, 0400, 1020, 1220, 1600, 1800, 2000, 2200
13 Oct 86	0000, 0400, 0900, 1100, 1300, 1500, 1700
14 Oct 86	1200, 1400, 1600, 1800, 2000
15 Oct 86	1015, 1100, 1300, 1700, 1900, 2100, 2300
16 Oct 86	0100, 0300, 0500, 0700, 1004, 1204, 1404, 1604, 1815, 2015, 2215
17 Oct 86	0015, 0215, 0415, 0615, 0815, 1015, 1215, 1400, 1600, 1800, 2000, 2200
18 Oct 86	0000, 0200, 0400, 0600, 0800, 1000, 1200, 1850, 2150
19 Oct 86	0050, 0350, 0650, 1250, 1550, 1930
20 Oct 86	0140, 0750, 2000, 2300
21 Oct 86	0200, 0500, 0800, 1100, 1400, 1700
22 Oct 86	1030, 1630, 2230
23 Oct 86	0430, 1030, 1815
24 Oct 86	0015, 0615, 1215

casting model being developed for the US Navy. The model had been previously tested with limited data; however, SUPERDUCK provided an opportunity to test and evaluate it using both actual nearshore wave data and deepwater directional wave forecasts generated by the Navy's Global Spectral Ocean Wave Model (GSOWM).

Experiment plan

196. A Hewlett-Packard 9020A computer system was installed on 19 October. Test forecasts and hindcasts were made between 21-26 October.

Data collection schedule

197. A time period late in October was originally selected for data collection to increase the probability of relatively high waves. Because significant wave heights after 20 October were around 1 m, model capabilities were not tested to the extent desired. During these low-wave conditions, the GSOWM data appeared to overpredict the observed low-wave heights at some times, thus affecting the surf forecasts. For these reasons, data from an earlier high-wave event (10-14 October) with significant wave heights up to approximately 3 m will be used for hindcast tests.

198. Main model components were the surf forecasting model and a separate wave refraction model. Because wave refraction calculations are much more

time-consuming than surf calculations, this division permits prior calculation of wave refraction information for regions of interest.

199. Parts of the surf forecasting model cover wave aspects outside the surf zone. The model can use deepwater input consisting of directional spectra or wave parameters (height, period, and direction). Directional spectra forecasts will be provided by GSOWM. Wave parameter input allows use of measured, locally observed, or locally forecast wave information. For parameter input, directional spectra are fit to the parameters. Each directional spectra component (24 directions and 15 frequencies for GSOWM) is modified for wave refraction using previously calculated tables of refraction coefficients and refraction direction changes. Directional spectra just outside of the surf zone provide the total wave energy (i.e. variance from which significant wave height is computed), the dominant frequency associated with maximum wave energy, and a direction determined so that this three-parameter representation has the same longshore momentum flux as that obtained from the 24 x 15 element directional spectra.

200. Within the surf zone, a modified version of Thornton and Guza's (1983) work combined with Longuet-Higgins' (1970) radiation stress longshore current model is used. The relationship between the local rate of loss of energy as a result of wave breaking and the bottom stress associated with longshore currents provides longshore current horizontal profiles. For these calculations, provision is made for the user to input the most recent nearshore bottom profile because depths within the surf zone may change rapidly. Surf forecasts at several locations within a region for which refraction effects are calculated can be made without repeating the refraction and deepwater aspects of the model.

201. Refraction information is calculated from a 2-D depth grid which typically covers a region from the coast to depths of a few hundred feet and several miles along the coast of interest. Two refraction models operate on the HP-9020A and provide outputs formatted for automatic input to the surf forecasting model. The first is a modified version of Dobson's (1967) well-known numerical wave ray refraction program. The second is a modified version of CERC's program, Regional Coastal Processes Numerical Wave Model (RCPWAVE) (Ebersole et al. 1986), which provides finite-difference solutions of wave velocity potential field equations at each grid point and considers wave diffraction. For this application, some of the RCPWAVE modifications involved

automatic decisions and intelligence to assure that various types of numerical problems are automatically solved or avoided. The modified RCPWAVE model will be used in place of the modified Dobson model as the operational refraction model.

PART VI: SUMMARY

202. The SUPERDUCK experiment provided a unique framework for a variety of coastal field studies. Although the studies varied widely, from improving basic observation techniques to very sophisticated arrays of fixed instruments, all the experiments benefited from the cooperative nature of the investigations and from mutual sharing of the collected data.

203. This report has described the 30 experiments conducted during the three phases (nonstorm wave, storm wave, and all weather) of SUPERDUCK and summarizes the survey, instrument, and other data which were collected. Much work remains in processing, interpreting, and reporting on the data collected by each of these studies.

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APPENDIX A: SUMMARY OF SUPERDUCK DIGITAL DATA COLLECTED BY THE FRF

This appendix includes tables of the hourly status of each instrument deployed during SUPERDUCK which was hooked up to either the FRF's Data General NOVA-4 minicomputer or the Digital Equipment VAX 11/750. The tables are organized by day and computer. Gage numbers and gage names refer to the gages listed in Table 1 and shown in Figure 2 of the main text. Gages which are part of the routine FRF data collection program have a gage name of "FRF". Other information included in the tables is defined below.

Gage Types

Type	Description
1	Baylor staff wave gage
2	Datawell Waverider buoy
3	Pressure wave gage
4	Electromagnetic current meter
6	Wind Speed
7	Wind Direction
8	Air Temperature
9	Atmospheric pressure
12	Tide gage
29	Sonar altimeter

Hourly Status Legend

Symbol	Description
O	Operational, data collected
N	No good, data collected
?	Questionable data collected
X	Gage inoperative and/or not on system
blank	Data not collected

Specific comments recorded by Dr. Joan Oltman-Shay regarding the operational status of the longshore current array are also included in the tables.

September 11, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
625	1	FRF	XXXXXXXXXXXXXXXXXXXXXXXX
675	1	FRF	0 0 0 000 0
645	1	FRF	0 0 0 000 0
616	9	FRF	0 0 0 000 0
621	3	FRF	0 0 0 000 0
679	4	FRF	0 0 0 000 0
689	4	FRF	0 0 0 000 0
630	2	FRF	? ? 0 000 0
640	2	FRF	? ? 0 000 0
632	6	FRF	0 0 0 000 0
633	7	FRF	0 0 0 000 0
624	8	FRF	0 0 0 000 0

September 12, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
675	1	FRF	0 0 000000000 0
645	1	FRF	0 0 000000000 0
616	9	FRF	0 0 000000000 0
621	3	FRF	0 0 000000000 0
679	4	FRF	0 0 000000000 0
689	4	FRF	0 0 000000000 0
630	2	FRF	0 0 000000000 0
640	2	FRF	0 0 000000000 0
632	6	FRF	0 0 000000000 0
633	7	FRF	0 0 000000000 0
624	8	FRF	0 0 000000000 0

September 13, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 11, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
675	1	FRF	00000 00000 000
645	1	FRF	00000 00000 000
616	9	FRF	00000 00000 000
621	3	FRF	00000 00000 000
679	4	FRF	00000 00000 000
689	4	FRF	00000 00000 000
624	8	FRF	00000 00000 000
630	2	FRF	????? 00000 000
640	2	FRF	????? 00000 000
632	6	FRF	00000 00000 000
633	7	FRF	00000 00000 000
111	3	LA01	NNNNN 00000 000
121	3	LA02	NNNNN 00000 000
131	3	LA03	NNNNN 00000 000
141	3	LA04	NNNNN 00000 000
151	3	LA05	NNNNN 00000 000
161	3	LA06	NNNNN 00000 000
171	3	LA07	NNNNN 00000 000
181	3	LA08	NNNNN 00000 000
191	3	LA09	NNNNN 00000 000
101	3	LA10	NNNNN 00000 000

September 12, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
675	1	FRF	0000 0000 0000 0000
645	1	FRF	0000 0000 0000 0000
616	9	FRF	0000 0000 0000 0000
621	3	FRF	0000 0000 0000 0000
679	4	FRF	0000 0000 0000 0000
689	4	FRF	0000 0000 0000 0000
624	8	FRF	0000 0000 0000 0000
630	2	FRF	0000 0000 0000 0000
640	2	FRF	0000 0000 0000 0000
632	6	FRF	0000 0000 0000 0000
633	7	FRF	0000 0000 0000 0000
111	3	LA01	0000 0000 0000 0000
121	3	LA02	NNNN NNNN NNNN NNNN
131	3	LA03	0000 0000 0000 0000
141	3	LA04	0000 0000 0000 0000
151	3	LA05	0000 0000 0000 0000
161	3	LA06	0000 0000 0000 0000
171	3	LA07	0000 0000 0000 0000
181	3	LA08	0000 0000 0000 0000
191	3	LA09	0000 0000 0000 0000
101	3	LA10	0000 0000 0000 0000

September 13, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
675	1	FRF	0000 0000 0000 0000
645	1	FRF	0000 0000 0000 0000
616	9	FRF	0000 0000 0000 0000
621	3	FRF	0000 0000 0000 0000
679	4	FRF	0000 0000 0000 0000
689	4	FRF	0000 0000 0000 0000
624	8	FRF	0000 0000 0000 0000
630	2	FRF	0000 0000 0000 0000
640	2	FRF	0000 0000 0000 0000
632	6	FRF	0000 0000 0000 0000
633	7	FRF	0000 0000 0000 0000
111	3	LA01	0000 0000 0000 0000
121	3	LA02	NNNN NNNN NNNN NNNN
131	3	LA03	0000 0000 0000 0000
141	3	LA04	0000 0000 0000 0000
151	3	LA05	0000 0000 0000 0000
161	3	LA06	0000 0000 0000 0000
171	3	LA07	0000 0000 0000 0000
181	3	LA08	0000 0000 0000 0000
191	3	LA09	0000 0000 0000 0000
101	3	LA10	0000 0000 0000 0000

September 14, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 15, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
625	1	FRF	? ? ?
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 16, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 14, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
675	1	FRF	0000 0000 0000 0000
645	1	FRF	0000 0000 0000 0000
616	9	FRF	0000 0000 0000 0000
621	3	FRF	0000 0000 0000 0000
679	4	FRF	0000 0000 0000 0000
689	4	FRF	0000 0000 0000 0000
624	8	FRF	0000 0000 0000 0000
630	2	FRF	0000 0000 0000 0000
640	2	FRF	0000 0000 0000 0000
632	6	FRF	0000 0000 0000 0000
633	7	FRF	0000 0000 0000 0000
111	3	LA01	0000 0000 0000 0000
121	3	LA02	NNNN NNNN NNNN NNNN
131	3	LA03	0000 0000 0000 0000
141	3	LA04	0000 0000 0000 0000
151	3	LA05	0000 0000 0000 0000
161	3	LA06	0000 0000 0000 0000
171	3	LA07	0000 0000 0000 0000
181	3	LA08	0000 0000 0000 0000
191	3	LA09	0000 0000 0000 0000
101	3	LA10	0000 0000 0000 0000

September 15, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
675	1	FRF	0000 0000
645	1	FRF	0000 0000
616	9	FRF	0000 0000
621	3	FRF	0000 0000
679	4	FRF	0000 0000
689	4	FRF	0000 0000
624	8	FRF	0000 0000
630	2	FRF	0000 0000
640	2	FRF	0000 0000
632	6	FRF	0000 0000
633	7	FRF	0000 0000
111	3	LA01	0000 0000
121	3	LA02	NNNN NNNN
131	3	LA03	0000 0000
141	3	LA04	0000 0000
151	3	LA05	0000 0000
161	3	LA06	0000 0000
171	3	LA07	0000 0000
181	3	LA08	0000 0000
191	3	LA09	0000 0000
101	3	LA10	0000 0000

September 16, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
675	1	FRF	0000 0000 0000 00
645	1	FRF	0000 0000 0000 00
616	9	FRF	0000 0000 0000 00
621	3	FRF	0000 0000 0000 00
679	4	FRF	0000 0000 0000 00
689	4	FRF	0000 0000 0000 00
624	8	FRF	0000 0000 0000 00
630	2	FRF	0000 0000 0000 00
640	2	FRF	0000 0000 0000 00
632	6	FRF	0000 0000 0000 00
633	7	FRF	0000 0000 0000 00
111	3	LA01	0000 0000 0000 00
121	3	LA02	NNNN NNNN NNNN NN
131	3	LA03	0000 0000 0000 00
141	3	LA04	0000 0000 0000 00
151	3	LA05	0000 0000 0000 00
161	3	LA06	0000 0000 0000 00
171	3	LA07	0000 0000 0000 00
181	3	LA08	0000 0000 0000 00
191	3	LA09	0000 0000 0000 00
101	3	LA10	0000 0000 0000 00

September 17, 1986: NOVA-4 Data Collection

```
                    Hourly Status
Gage   Gage  Gage             111111111122222
Number Type  Name   012345678901234567890123
 675    1    FRF     0     0     0     0    
 645    1    FRF     0     0     0     0    
 616    9    FRF     0     0     0     0    
 621    3    FRF     0     0     0     0    
 679    4    FRF     0     0     0     0    
 689    4    FRF     0     0     0     0    
 630    2    FRF     0     0     0     0    
 640    2    FRF     0     0     0     0    
 632    6    FRF     0     0     0     0    
 633    7    FRF     0     0     0     0    
 624    8    FRF     0     0     0     0    
```

September 18, 1986: NOVA-4 Data Collection

```
                    Hourly Status
Gage   Gage  Gage             11111111112222
Number Type  Name   012345678901234567890123
 625    1    FRF                 0          
 675    1    FRF     0     0     0          
 645    1    FRF     0     0     0          
 616    9    FRF     0     0     0          
 621    3    FRF     0     0     0          
 679    4    FRF     0     0     0          
 689    4    FRF     0     0     0          
 630    2    FRF     0     0     0          
 640    2    FRF     0     0     0          
 632    6    FRF     0     0     0          
 633    7    FRF     0     0     0          
 624    8    FRF     0     0     0          
```

September 19, 1986: NOVA-4 Data Collection

```
                    Hourly Status
Gage   Gage  Gage             11111111112222
Number Type  Name   012345678901234567890123
 625    1    FRF           0     0     0    
 675    1    FRF           0     0     0    
 645    1    FRF           0     0     0    
 616    9    FRF           0     0     0    
 621    3    FRF           0     0     0    
 679    4    FRF           0     0     0    
 689    4    FRF           0     0     0    
 630    2    FRF           0     0     0    
 640    2    FRF           0     0     0    
 632    6    FRF           0     0     0    
 633    7    FRF           0     0     0    
 624    8    FRF           0     0     0    
```

September 17, 1986 VAX Data Collection

```
                    Hourly Status
Gage   Gage  Gage             11111111112222
Number Type  Name   012345678901234567890123
 625    1    FRF                     0000  0
 675    1    FRF    00         0000  0000  0
 645    1    FRF    00         0000  0000  0
 616    9    FRF    00         0000  0000  0
 621    3    FRF    00         0000  0000  0
 679    4    FRF    00         0000  0000  0
 689    4    FRF    00         0000  0000  0
 624    8    FRF    00         0000  0000  0
 630    2    FRF    00         0000  0000  0
 640    2    FRF    00         0000  0000  0
 632    6    FRF    00         0000  0000  0
 633    7    FRF    00         0000  0000  0
 111    3    LA01   00         0000  0000  0
 121    3    LA02   00         0000  0000  0
 131    3    LA03   00         0000  0000  0
 141    3    LA04   00         0000  0000  0
 151    3    LA05   00         0000  0000  0
 161    3    LA06   00         0000  0000  0
 171    3    LA07   00         0000  0000  0
 181    3    LA08   00         0000  0000  0
 191    3    LA09   00         0000  0000  0
 101    3    LA10   00         0000  0000  0
```

September 18, 1986 VAX Data Collection

```
                    Hourly Status
Gage   Gage  Gage             11111111112222
Number Type  Name   012345678901234567890123
 625    1    FRF          00000000  0000  00
 675    1    FRF          00000000  0000  00
 645    1    FRF          00000000  0000  00
 616    9    FRF          00000000  0000  00
 621    3    FRF          00000000  0000  00
 679    4    FRF          00000000  0000  00
 689    4    FRF          00000000  0000  00
 624    8    FRF          00000000  0000  00
 630    2    FRF          00000000  0000  00
 640    2    FRF          00000000  0000  00
 632    6    FRF          00000000  0000  00
 633    7    FRF          00000000  0000  00
 111    3    LA01         00000000  0000  00
 121    3    LA02         NNNNNNNN  NNNN  NN
 131    3    LA03         00000000  0000  00
 141    3    LA04         00000000  0000  00
 151    3    LA05         00000000  0000  00
 161    3    LA06         00000000  0000  00
 171    3    LA07         00000000  0000  00
 181    3    LA08         00000000  0000  00
 191    3    LA09         00000000  0000  00
 101    3    LA10         00000000  0000  00
```

September 19, 1986 VAX Data Collection

```
                    Hourly Status
Gage   Gage  Gage             11111111112222
Number Type  Name   012345678901234567890123
 625    1    FRF    0000     00000000  0000 
 675    1    FRF    0000     00000000  0000 
 645    1    FRF    0000     00000000  0000 
 616    9    FRF    0000     00000000  0000 
 621    3    FRF    0000     00000000  0000 
 679    4    FRF    0000     00000000  0000 
 689    4    FRF    0000     00000000  0000 
 624    8    FRF    0000     00000000  0000 
 630    2    FRF    0000     00000000  0000 
 640    2    FRF    0000     00000000  0000 
 632    6    FRF    0000     00000000  0000 
 633    7    FRF    0000     00000000  0000 
 111    3    LA01   0000     00000000  0000 
 121    3    LA02   NNNN     NNNNNNNN  NNNN 
 131    3    LA03   0000     00000000  0000 
 141    3    LA04   0000     00000000  0000 
 151    3    LA05   0000     00000000  0000 
 161    3    LA06   0000     00000000  0000 
 171    3    LA07   0000     00000000  0000 
 181    3    LA08   0000     00000000  0000 
 191    3    LA09   0000     00000000  0000 
 101    3    LA10   0000     00000000  0000 
```

September 20, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 / 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 21, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 / 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 22, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 / 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 20, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 / 012345678901234567890123
625	1	FRF	0000 000000000000000
675	1	FRF	0000 000000000000000
645	1	FRF	0000 000000000000000
616	9	FRF	0000 000000000000000
621	3	FRF	0000 000000000000000
679	4	FRF	0000 000000000000000
689	4	FRF	0000 000000000000000
624	8	FRF	0000 000000000000000
630	2	FRF	0000 000000000000000
640	2	FRF	0000 000000000000000
632	6	FRF	0000 000000000000000
633	7	FRF	0000 000000000000000
111	3	LA01	0000 000000000000000
121	3	LA02	NNNN NNNNNNNNNNNNNNN
131	3	LA03	0000 000000000000000
141	3	LA04	0000 000000000000000
151	3	LA05	0000 000000000000000
161	3	LA06	0000 000000000000000
171	3	LA07	0000 000000000000000
181	3	LA08	0000 000000000000000
191	3	LA09	0000 000000000000000
101	3	LA10	0000 000000000000000

September 21, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 / 012345678901234567890123
625	1	FRF	000 0000 0000000000
675	1	FRF	000 0000 0000000000
645	1	FRF	000 0000 0000000000
616	9	FRF	000 0000 0000000000
621	3	FRF	000 0000 0000000000
679	4	FRF	000 0000 0000000000
689	4	FRF	000 0000 0000000000
624	8	FRF	000 0000 0000000000
630	2	FRF	000 0000 0000000000
640	2	FRF	000 0000 0000000000
632	6	FRF	000 0000 0000000000
633	7	FRF	000 0000 0000000000
111	3	LA01	000 0000 0000000000
121	3	LA02	NNN NNNN NNNNNNNNNN
131	3	LA03	000 0000 0000000000
141	3	LA04	000 0000 0000000000
151	3	LA05	000 0000 0000000000
161	3	LA06	000 0000 0000000000
171	3	LA07	000 0000 0000000000
181	3	LA08	000 0000 0000000000
191	3	LA09	000 0000 0000000000
101	3	LA10	000 0000 0000000000

September 22, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 / 012345678901234567890123
625	1	FRF	0000000 0000
675	1	FRF	0000000 0000
645	1	FRF	0000000 0000
616	9	FRF	0000000 0000
621	3	FRF	0000000 0000
679	4	FRF	0000000 0000
689	4	FRF	0000000 0000
624	8	FRF	0000000 0000
630	2	FRF	0000000 0000
640	2	FRF	0000000 0000
632	6	FRF	0000000 0000
633	7	FRF	0000000 0000
111	3	LA01	0000000 0000
121	3	LA02	NNNNNNN NNNN
131	3	LA03	0000000 0000
141	3	LA04	0000000 0000
151	3	LA05	0000000 0000
161	3	LA06	0000000 0000
171	3	LA07	0000000 0000
181	3	LA08	0000000 0000
191	3	LA09	0000000 0000
101	3	LA10	0000000 0000

September 23, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
625	1	FRF		0						0						0										
675	1	FRF		0						0						0										
645	1	FRF		0						0						0										
616	9	FRF		0						0						0										
621	3	FRF		0						0						0										
679	4	FRF		0						0						0										
689	4	FRF		0						0						0										
630	2	FRF		0						0						0										
640	2	FRF		0						0						0										
632	6	FRF		0						0						0										
633	7	FRF		0						0						0										
624	8	FRF		0						0						0										

September 24, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
625	1	FRF								0						0						0				
675	1	FRF								0						0						0				
645	1	FRF								0						0						0				
616	9	FRF								0						0						0				
621	3	FRF								0						0						0				
679	4	FRF								0						0						0				
689	4	FRF								0						0						0				
630	2	FRF								0						0						0				
640	2	FRF								0						0						0				
632	6	FRF								0						0						0				
633	7	FRF								0						0						0				
624	8	FRF								0						0						0				

September 25, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
625	1	FRF		0						0						0						0				
675	1	FRF		0						0						0						0				
645	1	FRF		0						0						0						0				
616	9	FRF		0						0						0						0				
621	3	FRF		0						0						0						0				
679	4	FRF		0						0						0						0				
689	4	FRF		0						0						0						0				
630	2	FRF		0						0						0						0				
640	2	FRF		0						0						0						0				
632	6	FRF		0						0						0						0				
633	7	FRF		0						0						0						0				
624	8	FRF		0						0						0						0				

September 23, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
625	1	FRF																								
675	1	FRF																								
645	1	FRF																								
616	9	FRF																								
621	3	FRF																								
679	4	FRF																								
689	4	FRF																								
624	8	FRF																								
630	2	FRF																								
640	2	FRF																								
632	6	FRF																								
633	7	FRF																								
111	3	LA01																								
121	3	LA02																								
131	3	LA03																								
141	3	LA04																								
151	3	LA05																								
161	3	LA06																								
171	3	LA07																								
181	3	LA08																								
191	3	LA09																								
101	3	LA10																								

September 24, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
625	1	FRF																								
675	1	FRF																								
645	1	FRF																								
616	9	FRF																								
621	3	FRF																								
679	4	FRF																								
689	4	FRF																								
624	8	FRF																								
630	2	FRF																								
640	2	FRF																								
632	6	FRF																								
633	7	FRF																								
111	3	LA01																								
121	3	LA02																								
131	3	LA03																								
141	3	LA04																								
151	3	LA05																								
161	3	LA06																								
171	3	LA07																								
181	3	LA08																								
191	3	LA09																								
101	3	LA10																								

September 25, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
625	1	FRF																		0	0	0	0			
675	1	FRF																		0	0	0	0			
645	1	FRF																		0	0	0	0			
616	9	FRF																		0	0	0	0			
621	3	FRF																		0	0	0	0			
679	4	FRF																		0	0	0	0			
689	4	FRF																		0	0	0	0			
624	8	FRF																		0	0	0	0			
630	2	FRF																		0	0	0	0			
640	2	FRF																		0	0	0	0			
632	6	FRF																		0	0	0	0			
633	7	FRF																		0	0	0	0			
111	3	LA01																		0	0	0	0			
121	3	LA02																		0	0	0	0			
131	3	LA03																		0	0	0	0			
141	3	LA04																		0	0	0	0			
151	3	LA05																		0	0	0	0			
161	3	LA06																		0	0	0	0			
171	3	LA07																		0	0	0	0			
181	3	LA08																		0	0	0	0			
191	3	LA09																		0	0	0	0			
101	3	LA10																		0	0	0	0			

September 26, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 27, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	? ? N 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 28, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	N 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 26, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

September 27, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

September 28, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

September 29, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 30, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
625	1	FRF	0 0 ? 0
675	1	FRF	0 0 ? 0
645	1	FRF	0 0 ? 0
616	9	FRF	0 0 0 0
621	3	FRF	0 N ? 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 ? 0 0
640	2	FRF	0 ? 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

October 1, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

September 29, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

September 30, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
600	12	TIDE	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

October 1, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
600	12	TIDE	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

October 2, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

October 3, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 0
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

October 4, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	0 0 0 0
675	1	FRF	0 0 0 N
645	1	FRF	0 0 0 0
616	9	FRF	0 0 0 0
621	3	FRF	0 0 0 0
679	4	FRF	0 0 0 0
689	4	FRF	0 0 0 0
630	2	FRF	0 0 0 0
640	2	FRF	0 0 0 0
632	6	FRF	0 0 0 0
633	7	FRF	0 0 0 0
624	8	FRF	0 0 0 0

October 2, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
600	12	TIDE	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

October 3, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
600	12	TIDE	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

October 4, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
625	1	FRF	
675	1	FRF	
645	1	FRF	
616	9	FRF	
621	3	FRF	
679	4	FRF	
689	4	FRF	
624	8	FRF	
630	2	FRF	
640	2	FRF	
632	6	FRF	
633	7	FRF	
600	12	TIDE	
111	3	LA01	
121	3	LA02	
131	3	LA03	
141	3	LA04	
151	3	LA05	
161	3	LA06	
171	3	LA07	
181	3	LA08	
191	3	LA09	
101	3	LA10	

October 5, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
625	1	FRF	0						0						0						0					
675	1	FRF	N						0						0						0					
645	1	FRF	?						0						0						0					
616	9	FRF	0						0						0						0					
621	3	FRF	0						0						0						0					
679	4	FRF	0						0						0						0					
689	4	FRF	0						0						0						0					
630	2	FRF	0						0						0						0					
640	2	FRF	0						0						0						0					
632	6	FRF	0						0						0						0					
633	7	FRF	0						0						0						0					
624	8	FRF	0						0						0						0					

October 5, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
625	1	FRF																								
675	1	FRF																								
645	1	FRF																								
616	9	FRF																								
621	3	FRF																								
679	4	FRF																								
689	4	FRF																								
624	8	FRF																								
630	2	FRF																								
640	2	FRF																								
632	6	FRF																								
633	7	FRF																								
600	12	TIDE																								
111	3	LA01																								
121	3	LA02																								
131	3	LA03																								
141	3	LA04																								
151	3	LA05																								
161	3	LA06																								
171	3	LA07																								
181	3	LA08																								
191	3	LA09																								
101	3	LA10																								

October 6, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	00000000000
319	4	LS01	00000000000
621	3	FRF	0 0 00000000000
679	4	FRF	0 0 00000000000
689	4	FRF	0 0 00000000000
600	12	TIDE	NNNNNNNNNNN
409	4	CS10	XXXXXXXXXXX
509	4	CS10	XXXXXXXXXXX
411	3	CS01	???????????
421	3	CS02	???????????
431	3	CS03	???????????
441	3	CS04	???????????
451	3	CS05	???????????
461	3	CS06	???????????
471	3	CS07	???????????
418	29	CS01	NNNNNNNNNNN
428	29	CS02	NNNNNNNNNNN
438	29	CS03	NNNNNNNNNNN
448	29	CS04	00000000000
458	29	CS05	00000000000
468	29	CS06	NNNNNNNNNNN
478	29	CS07	00000000000
818	29	CS08	XXXXXXXXXXX
449	4	CS11	XXXXXXXXXXX
549	4	CS11	XXXXXXXXXXX
625	1	FRF	0 0 00000000000
675	1	FRF	0 0 00000000000
645	1	FRF	0 0 00000000000
630	2	FRF	0 0 00000000000
640	2	FRF	0 0 00000000000
616	9	FRF	0 0 00000000000
624	8	FRF	00000000000
632	6	FRF	0 0 00000000000
633	7	FRF	0 0 00000000000

October 6, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123	
219	4	LS01	0000 0000	
319	4	LS01	0000 0000	
621	3	FRF	0000 0000	
679	4	FRF	0000 0000	
689	4	FRF	0000 0000	
600	12	TIDE	NNNN NNNN	
409	4	CS10	XXXX XXXX	
509	4	CS10	XXXX XXXX	
411	3	CS01	???? ????	
421	3	CS02	???? ????	
431	3	CS03	???? ????	
441	3	CS04	???? ????	
451	3	CS05	???? ????	
461	3	CS06	???? ????	
471	3	CS06	???? ????	
418	29	CS01	NNNN NNNN	
428	29	CS02	NNNN NNNN	
438	29	CS03	NNNN NNNN	
448	29	CS04	0000 0000	
458	29	CS05	0000 0000	
468	29	CS06	NNNN NNNN	
478	29	CS07	0000 0000	
818	29	CS08	XXXX XXXX	
449	4	CS11	XXXX XXXX	
549	4	CS11	XXXX XXXX	
111	3	LA01	0000 0000	
121	3	LA02	0000 0000	
131	3	LA03	0000 0000	
141	3	LA04	0000 0000	
151	3	LA05	0000 0000	
161	3	LA06	0000 0000	
171	3	LA07	0000 0000	
181	3	LA08	0000 0000	
191	3	LA09	0000 0000	
101	3	LA10	NNNN NNNN	
229	4	LS02	NNNN NNNN	Filter problem
329	4	LS02	0000 0000	
239	4	LS03	0000 0000	
339	4	LS03	0000 0000	
249	4	LS04	0000 0000	
349	4	LS04	0000 0000	
259	4	LS05	0000 0000	
359	4	LS05	0000 0000	
269	4	LS06	0000 0000	
369	4	LS06	0000 0000	
279	4	LS07	0000 0000	
379	4	LS07	0000 0000	
289	4	LS08	0000 0000	
389	4	LS08	0000 0000	
299	4	LS09	0000 0000	Low amplitude signals
399	4	LS09	0000 0000	Low amplitude signals
209	4	LS10	NNNN NNNN	Wiring problem
309	4	LS10	NNNN NNNN	Wiring problem

October 7, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNXXXXXXXXX
409	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
509	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
411	3	CS01	????????????????????????
421	3	CS02	????????????????????????
431	3	CS03	????????????????????????
441	3	CS04	????????????????????????
451	3	CS05	????????????????????????
461	3	CS06	????????????????????????
471	3	CS07	????????????????????????
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	NNNNNNNNNNNNNNNNNNNNNNNN
478	29	CS07	????????????????????????
818	29	CS08	XXXXXXXXXXXXXXXXXXXXXXXX
449	4	CS11	XXXXXXXXXXXXXXXXXXXXXXXX
549	4	CS11	XXXXXXXXXXXXXXXXXXXXXXXX
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000

October 7, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123	
219	4	LS01	0000 0000 0000 0000	X and Y crossed, fixed by 1400
319	4	LS01	0000 0000 0000 0000	X and Y crossed, fixed by 1400
621	3	FRF	0000 0000 0000 0000	
679	4	FRF	0000 0000 0000 0000	
689	4	FRF	0000 0000 0000 0000	
600	12	TIDE	NNNN NNNN NNNN NNNN	
409	4	CS10	XXXX XXXX XXXX XXXX	
509	4	CS10	XXXX XXXX XXXX XXXX	
411	3	CS01	???? ???? ???? ????	
421	3	CS02	???? ???? ???? ????	
431	3	CS03	???? ???? ???? ????	
441	3	CS04	???? ???? ???? ????	
451	3	CS05	???? ???? ???? ????	
461	3	CS06	???? ???? ???? ????	
471	3	CS06	???? ???? ???? ????	
418	29	CS01	???? ???? ???? ????	
428	29	CS02	???? ???? ???? ????	
438	29	CS03	???? ???? ???? ????	
448	29	CS04	???? ???? ???? ????	
458	29	CS05	???? ???? ???? ????	
468	29	CS06	NNNN NNNN NNNN NNNN	
478	29	CS07	???? ???? ???? ????	
818	29	CS08	XXXX XXXX XXXX XXXX	
449	4	CS11	XXXX XXXX XXXX XXXX	
549	4	CS11	XXXX XXXX XXXX XXXX	
111	3	LA01	0000 0000 0000 0000	
121	3	LA02	0000 0000 0000 0000	
131	3	LA03	0000 0000 0000 0000	
141	3	LA04	0000 0000 0000 0000	
151	3	LA05	0000 0000 0000 0000	
161	3	LA06	0000 0000 0000 0000	
171	3	LA07	0000 0000 0000 0000	
181	3	LA08	0000 0000 0000 0000	
191	3	LA09	0000 0000 0000 0000	
101	3	LA10	NNNN 0000 0000 0000	
229	4	LS02	NNNN 0000 0000 0000	Filter problem, fixed by 0730
329	4	LS02	0000 0000 0000 0000	
239	4	LS03	0000 0000 0000 0000	
339	4	LS03	0000 0000 0000 0000	
249	4	LS04	0000 0000 0000 0000	
349	4	LS04	0000 0000 0000 0000	
259	4	LS05	0000 0000 0000 0000	
359	4	LS05	0000 0000 0000 0000	
269	4	LS06	0000 0000 0000 0000	
369	4	LS06	0000 0000 0000 0000	
279	4	LS07	0000 0000 0000 0000	
379	4	LS07	0000 0000 0000 0000	
289	4	LS08	0000 0000 0000 0000	Low amplitude signals
389	4	LS08	0000 0000 0000 0000	Low amplitude signals
299	4	LS09	0000 0000 0000 0000	Probe 2-3 cm above bed
399	4	LS09	0000 0000 0000 0000	Probe 2-3 cm above bed
209	4	LS10	NNNN NNNN NNNN NNNN	X bad
309	4	LS10	0000 0000 0000 0000	Y looks ok, but noisy

October 8, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 0123456789012	Hourly Status 16-23 (67890123)
219	4	LS01	0000000000000	?0000000
319	4	LS01	0000000000000	?0000000
621	3	FRF	0000000000000	00000000
679	4	FRF	0000000000000	00000000
689	4	FRF	0000000000000	00000000
600	12	TIDE	XXXXXXXXXXXXX	NNNNNNNN
449	4	CS11	XXXXXXXXXXXXX	XXXXXXXX
549	4	CS11	XXXXXXXXXXXXX	XXXXXXXX
409	4	CS10	XXXXXXXXXXXXX	XXXXXXXX
509	4	CS10	XXXXXXXXXXXXX	XXXXXXXX
411	3	CS01	NNNNNNNNNNNNN	NNNNNNNN
421	3	CS02	?????????????	????????
431	3	CS03	?????????????	????????
441	3	CS04	?????????????	????????
451	3	CS05	?????????????	????????
461	3	CS06	?????????????	????????
471	3	CS07	NNNNNNNNNNNNN	NNNNNNNN
418	29	CS01	?????????????	????????
428	29	CS02	?????????????	????????
438	29	CS03	?????????????	????????
448	29	CS04	?????????????	????????
458	29	CS05	?????????????	????????
468	29	CS06	?????????????	????????
478	29	CS07	?????????????	????????
625	1	FRF	0000000000000	NNNNNNNN
675	1	FRF	0000000000000	NNNNNNNN
645	1	FRF	0000000000000	NNNNNNNN
630	2	FRF	0000000000000	00000000
640	2	FRF	0000000000000	00000000
616	9	FRF	0000000000000	00000000
624	8	FRF	0000000000000	00000000
632	6	FRF	0000000000000	00000000
633	7	FRF	0000000000000	00000000

October 8, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status			
219	4	LS01	0000	0000	000	
319	4	LS01	0000	0000	000	
621	3	FRF	0000	0000	000	
679	4	FRF	0000	0000	000	
689	4	FRF	0000	0000	000	
600	12	TIDE	NNNN	NNNN	NNN	
449	4	CS11	XXXX	XXXX	XXX	
549	4	CS11	XXXX	XXXX	XXX	
409	4	CS10	XXXX	XXXX	XXX	
509	4	CS10	XXXX	XXXX	XXX	
411	3	CS01	????	????	???	
421	3	CS02	????	????	???	
431	3	CS03	????	????	???	
441	3	CS04	????	????	???	
451	3	CS05	????	????	???	
461	3	CS06	????	????	???	
471	3	CS06	NNNN	NNNN	NNN	
418	29	CS01	????	????	???	
428	29	CS02	????	????	???	
438	29	CS03	????	????	???	
448	29	CS04	????	????	???	
458	29	CS05	????	????	???	
468	29	CS06	????	????	???	
478	29	CS07	????	????	???	
111	3	LA01	0000	0000	000	
121	3	LA02	0000	0000	000	
131	3	LA03	0000	0000	000	
141	3	LA04	0000	0000	000	
151	3	LA05	0000	0000	000	
161	3	LA06	0000	0000	000	
171	3	LA07	0000	0000	000	
181	3	LA08	0000	0000	000	
191	3	LA09	0000	0000	000	
101	3	LA10	0000	0000	000	
229	4	LS02	0000	0000	000	
329	4	LS02	0000	0000	000	
239	4	LS03	0000	0000	000	
339	4	LS03	0000	0000	000	
249	4	LS04	0000	0000	000	
349	4	LS04	0000	0000	000	
259	4	LS05	0000	0000	000	
359	4	LS05	0000	0000	000	
269	4	LS06	0000	0000	000	
369	4	LS06	0000	0000	000	
279	4	LS07	0000	0000	000	
379	4	LS07	0000	0000	000	
289	4	LS08	0000	0000	000	Low amplitude signal
389	4	LS08	0000	0000	000	Low amplitude signal
299	4	LS09	0000	0000	000	+X = -Y prior to system check
399	4	LS09	0000	0000	000	
209	4	LS10	NNNN	NNNN	000	Fixed during system check
309	4	LS10	0000	0000	000	Fixed during system check

October 9, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
600	12	TIDE	NNNNNNNNXXXXXXXX00000000
449	4	CS11	XXXXXXXXNNNOO?NNNNNNNNNN
549	4	CS11	XXXXXXXXNNNOO?NNNNNNNNNN
409	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
509	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
411	3	CS01	NNNNNNNNNNNNNNNNNNNNNNNN
421	3	CS02	????????????????????????
431	3	CS03	????????????????????????
441	3	CS04	????????????????????????
451	3	CS05	????????????????????????
461	3	CS06	????????????????????????
471	3	CS07	NNNNNNNNNNNNNNNNNNNNNNNN
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000

October 9, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123	
219	4	LS01	0 0000 0000 0000 00	
319	4	LS01	0 0000 0000 0000 00	
621	3	FRF	0 0000 0000 0000 00	
679	4	FRF	0 0000 0000 0000 00	
689	4	FRF	0 0000 0000 0000 00	
600	12	TIDE	N NNNN NNNN ???? ??	
449	4	CS11	X XXXX XXXX XXXX XX	
549	4	CS11	X XXXX XXXX XXXX XX	
409	4	CS10	X XXXX XXXX XXXX XX	
509	4	CS10	X XXXX XXXX XXXX XX	
411	3	CS01	N NNNN NNNN NNNN NN	
421	3	CS02	? ???? ???? ???? ??	
431	3	CS03	? ???? ???? ???? ??	
441	3	CS04	? ???? ???? ???? ??	
451	3	CS05	? ???? ???? ???? ??	
461	3	CS06	? ???? ???? ???? ??	
471	3	CS06	N NNNN NNNN NNNN NN	
418	29	CS01	? ???? ???? ???? ??	
428	29	CS02	? ???? ???? ???? ??	
438	29	CS03	? ???? ???? ???? ??	
448	29	CS04	? ???? ???? ???? ??	
458	29	CS05	? ???? ???? ???? ??	
468	29	CS06	? ???? ???? ???? ??	
478	29	CS07	? ???? ???? ???? ??	
111	3	LA01	0 0000 0000 0000 00	
121	3	LA02	0 0000 0000 0000 00	
131	3	LA03	0 0000 0000 0000 00	
141	3	LA04	0 0000 0000 0000 0C	
151	3	LA05	0 0000 0000 0000 00	
161	3	LA06	0 0000 0000 0000 00	
171	3	LA07	0 0000 0000 0000 00	
181	3	LA08	0 0000 0000 0000 00	
191	3	LA09	0 0000 0000 0000 00	
101	3	LA10	0 0000 0000 0000 00	
229	4	LS02	0 0000 0000 0000 00	
329	4	LS02	0 0000 0000 0000 00	
239	4	LS03	0 0000 0000 0000 00	
339	4	LS03	0 0000 0000 0000 00	
249	4	LS04	0 0000 0000 0000 00	
349	4	LS04	0 0000 0000 0000 00	
259	4	LS05	0 0000 0000 0000 00	
359	4	LS05	0 0000 0000 0000 00	
269	4	LS06	0 0000 0000 0000 00	
369	4	LS06	0 0000 0000 0000 00	
279	4	LS07	0 0000 0000 0000 00	
379	4	LS07	0 0000 0000 0000 00	
289	4	LS08	0 0000 0000 0000 00	Low amplitude signal
389	4	LS08	0 0000 0000 0000 00	Low amplitude signal
299	4	LS09	0 0000 0000 0000 00	
399	4	LS09	0 0000 0000 0000 00	
209	4	LS10	N NNNN NNNN NNNN NN	
309	4	LS10	0 0000 0000 0000 00	

October 10, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
600	12	TIDE	NNNNNNNNXXXXXXX000000000
449	4	CS11	NNNNNNNNNNNNOONNNNNNNNNN
549	4	CS11	NNNNNNNNNNNNOONNNNNNNNNN
409	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
509	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
411	3	CS01	??????????00000000000000
421	3	CS02	??????????00000000000000
431	3	CS03	??????????00000000000000
441	3	CS04	??????????00000000000000
451	3	CS05	??????????00000000000000
461	3	CS06	??????????00000000000000
471	3	CS07	NNNNNNNNNNNNXXXXXXXXXXXX
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	000000000000000000000NNN
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000

October 10, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123					
219	4	LS01	000	0000	0000	0000	0	Storm began in am
319	4	LS01	000	0000	0000	0000	0	
621	3	FRF	000	0000	0000	0000	0	
679	4	FRF	000	0000	0000	0000	0	
689	4	FRF	000	0000	0000	0000	0	
600	12	TIDE	000	0000	0000	0000	0	
449	4	CS11	NNN	NNNN	NOON	NNNN	N	
549	4	CS11	NNN	NNNN	NOON	NNNN	N	
409	4	CS10	XXX	XXXX	XXXX	XXXX	X	
509	4	CS10	XXX	XXXX	XXXX	XXXX	X	
411	3	CS01	???	????	0000	0000	0	
421	3	CS02	???	????	0000	0000	0	
431	3	CS03	???	????	0000	0000	0	
441	3	CS04	???	????	0000	0000	0	
451	3	CS05	???	????	0000	0000	0	
461	3	CS06	???	????	0000	0000	0	
471	3	CS06	NNN	NNNN	NNNN	NNNN	N	
418	29	CS01	???	????	????	????	?	
428	29	CS02	???	????	????	????	?	
438	29	CS03	???	????	????	????	?	
448	29	CS04	???	????	????	????	?	
458	29	CS05	???	????	????	????	?	
468	29	CS06	???	????	????	????	?	
478	29	CS07	???	????	????	????	?	
111	3	LA01	000	0000	0000	0000	0	
121	3	LA02	000	0000	0000	0000	0	
131	3	LA03	000	0000	0000	0000	0	
141	3	LA04	000	0000	0000	0000	0	
151	3	LA05	000	0000	0000	0000	0	
161	3	LA06	000	0000	0000	0000	0	
171	3	LA07	000	0000	0000	0000	0	
181	3	LA08	000	0000	0000	0000	0	
191	3	LA09	000	0000	0000	0000	0	
101	3	LA10	000	0000	0000	0000	0	
229	4	LS02	000	0000	0000	0000	0	
329	4	LS02	000	0000	0000	0000	0	
239	4	LS03	000	0000	0000	0000	0	
339	4	LS03	000	0000	0000	0000	0	
249	4	LS04	000	0000	0000	0000	0	
349	4	LS04	000	0000	0000	0000	0	
259	4	LS05	000	0000	0000	0000	0	
359	4	LS05	000	0000	0000	0000	0	
269	4	LS06	000	0000	0000	0000	0	
369	4	LS06	000	0000	0000	0000	0	
279	4	LS07	000	0000	0000	0000	0	
379	4	LS07	000	0000	0000	0000	0	
289	4	LS08	000	0000	0000	0000	0	Low amplitude signal
389	4	LS08	000	0000	0000	0000	0	Low amplitude signal
299	4	LS09	000	0000	0000	0000	0	
399	4	LS09	000	0000	0000	0000	0	
209	4	LS10	NNN	NNNN	NNNN	NNNN	N	
309	4	LS10	000	0000	0000	0000	0	
600	12	TIDE	000	0000	0000	0000	0	
488	29	CS08	000	0000	0000	0000	0	

October 11, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
449	4	CS11	NNNNNNNNNNNNNOONNNNNNNNN
549	4	CS11	NNNNNNNNNNNNNOONNNNNNNNN
409	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
509	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
411	3	CS01	000000000000000000000000
421	3	CS02	000000000000000000000000
431	3	CS03	000000000000000000000000
441	3	CS04	000000000000000000000000
451	3	CS05	000000000000000000000000
461	3	CS06	000000000000000000000000
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	NNNNNNNNNNNNNNNNNNNNNNNN
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	NON00000000N000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000
600	12	TIDE	XXXXXXXXXXXX000000000000
488	29	CS08	000000000000000000000000

October 11, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123				
219	4	LS01	000	0000	0000	0000	Glitches possible 1200-1600
319	4	LS01	000	0000	0000	0000	All channels
621	3	FRF	000	0000	0000	0000	
679	4	FRF	000	0000	0000	0000	
689	4	FRF	000	0000	0000	0000	
449	4	CS11	NNN	NNNN	NOON	NNNN	
549	4	CS11	NNN	NNNN	NOON	NNNN	
409	4	CS10	XXX	XXXX	XXXX	XXXX	
509	4	CS10	XXX	XXXX	XXXX	XXXX	
411	3	CS01	000	0000	0000	0000	
421	3	CS02	000	0000	0000	0000	
431	3	CS03	000	0000	0000	0000	
441	3	CS04	000	0000	0000	0000	
451	3	CS05	000	0000	0000	0000	
461	3	CS06	000	0000	0000	0000	
471	3	CS06	NNN	NNNN	NNNN	NNNN	
418	29	CS01	???	????	????	????	
428	29	CS02	???	????	????	????	
438	29	CS03	???	????	????	????	
448	29	CS04	???	????	????	????	
458	29	CS05	???	????	????	????	
468	29	CS06	???	????	????	????	
478	29	CS07	???	????	????	????	
111	3	LA01	000	0000	0000	0000	
121	3	LA02	000	0000	0000	0000	
131	3	LA03	000	0000	0000	0000	
141	3	LA04	000	0000	0000	0000	
151	3	LA05	000	0000	0000	0000	
161	3	LA06	000	0000	0000	0000	
171	3	LA07	000	0000	0000	0000	
181	3	LA08	000	0000	0000	0000	
191	3	LA09	000	0000	0000	0000	
101	3	LA10	000	0000	0000	0000	
229	4	LS02	000	0000	0000	0000	
329	4	LS02	000	0000	0000	0000	
239	4	LS03	000	0000	0000	0000	
339	4	LS03	000	0000	0000	0000	
249	4	LS04	000	0000	0000	0000	
349	4	LS04	000	0000	0000	0000	
259	4	LS05	000	0000	0000	0000	
359	4	LS05	000	0000	0000	0000	
269	4	LS06	000	0000	0000	0000	
369	4	LS06	000	0000	0000	0000	
279	4	LS07	000	0000	0000	0000	
379	4	LS07	000	0000	0000	0000	
289	4	LS08	000	0000	0000	0000	Low amplitude signal
389	4	LS08	000	0000	0000	0000	Low amplitude signal
299	4	LS09	000	0000	0000	0000	
399	4	LS09	000	0000	0000	0000	
209	4	LS10	NNN	NNNN	NNNN	NNNN	
309	4	LS10	000	0000	0000	0000	
600	12	TIDE	000	0000	0000	0000	
488	29	CS08	000	0000	0000	0000	

October 12, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
449	4	CS11	NNNNNNNNNNNNNOOONNNNNNNN
549	4	CS11	NNNNNNNNNNNNNOOONNNNNNNN
409	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
509	4	CS10	XXXXXXXXXXXXXXXXXXXXXXXX
411	3	CS01	000000000000000000000000
421	3	CS02	000000000000000000000000
431	3	CS03	000000000000000000000000
441	3	CS04	000000000000000000000000
451	3	CS05	000000000000000000000000
461	3	CS06	000000000000000000000000
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	NON00000000N000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000
600	12	TIDE	000000000000000000000000
488	29	CS08	000000000000000000000000

October 12, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 0123	4567	8901	2345	6789	0123	
219	4	LS01	0000		0000		0000	0000	
319	4	LS01	0000		0000		0000	0000	
621	3	FRF	0000		0000		0000	0000	
679	4	FRF	0000		0000		0000	0000	
689	4	FRF	0000		0000		0000	0000	
449	4	CS11	NNNN		NNNN		NOOO	NNNN	
549	4	CS11	NNNN		NNNN		NOOO	NNNN	
409	4	CS10	XXXX		XXXX		XXXX	XXXX	
509	4	CS10	XXXX		XXXX		XXXX	XXXX	
411	3	CS01	0000		0000		0000	0000	
421	3	CS02	0000		0000		0000	0000	
431	3	CS03	0000		0000		0000	0000	
441	3	CS04	0000		0000		0000	0000	
451	3	CS05	0000		0000		0000	0000	
461	3	CS06	0000		0000		0000	0000	
471	3	CS06	NNNN		NNNN		NNNN	NNNN	
418	29	CS01	????		????		????	????	
428	29	CS02	????		????		????	????	
438	29	CS03	????		????		????	????	
448	29	CS04	????		????		????	????	
458	29	CS05	??	????		????	????		
468	29	CS06	????		????		????	????	
478	29	CS07	????		????		????	????	
111	3	LA01	0000		0000		0000	0000	
121	3	LA02	0000		0000		0000	0000	
131	3	LA03	0000		0000		0000	0000	
141	3	LA04	0000		0000		0000	0000	
151	3	LA05	0000		0000		0000	0000	
161	3	LA06	0000		0000		0000	0000	
171	3	LA07	0000		0000		0000	0000	
181	3	LA08	0000		0000		0000	0000	
191	3	LA09	0000		0000		0000	0000	
101	3	LA10	0000		0000		0000	0000	
229	4	LS02	0000		0000		0000	0000	
329	4	LS02	0000		0000		0000	0000	
239	4	LS03	0000		0000		0000	0000	
339	4	LS03	0000		0000		0000	0000	
249	4	LS04	0000		0000		0000	0000	
349	4	LS04	0000		0000		0000	0000	
259	4	LS05	0000		0000		0000	0000	
359	4	LS05	0000		0000		0000	0000	
269	4	LS06	0000		0000		0000	0000	Strip chart looks good
369	4	LS06	0000		0000		0000	0000	Strip chart looks good
279	4	LS07	0000		0000		0000	0000	Strip chart looks good
379	4	LS07	0000		0000		0000	0000	Strip chart looks good
289	4	LS08	0000		0000		0000	0000	Low amplitude signal
389	4	LS08	0000		0000		0000	0000	Low amplitude signal
299	4	LS09	0000		0000		0000	0000	
399	4	LS09	0000		0000		0000	0000	
209	4	LS10	NNNN		NNNN		NNNN	NNNN	
309	4	LS10	0000		0000		0000	0000	
600	12	TIDE	0000		0000		0000	0000	
488	29	CS08	0000		0000		0000	0000	

October 13, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	00000000000000000
319	4	LS01	00000000000000000
621	3	FRF	00000000000000000
679	4	FRF	00000000000000000
689	4	FRF	00000000000000000
449	4	CS11	NNNOONNNNNNNNNOON
549	4	CS11	NNNOONNNNNNNNNOON
409	4	CS10	XXXXXXXXXXXXXXXXX
509	4	CS10	XXXXXXXXXXXXXXXXX
411	3	CS01	00000000000000000
421	3	CS02	00000000000000000
431	3	CS03	00000000000000000
441	3	CS04	00000000000000000
451	3	CS05	00000000000000000
461	3	CS06	00000000000000000
418	29	CS01	?????????????????
428	29	CS02	?????????????????
438	29	CS03	?????????????????
448	29	CS04	?????????????????
458	29	CS05	?????????????????
468	29	CS06	?????????????????
478	29	CS07	?????????????????
625	1	FRF	00000000000000000
675	1	FRF	00000000000000000
645	1	FRF	00000000000000000
630	2	FRF	00000000000000000
640	2	FRF	00000000000000000
616	9	FRF	00000000000000000
624	8	FRF	00000000000000000
632	6	FRF	00000000000000000
633	7	FRF	00000000000000000
600	12	TIDE	00000000000000000
488	29	CS08	00000000000000000

October 13, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123	
219	4	LS01	0000 0000	UPS system failure
319	4	LS01	0000 0000	
621	3	FRF	0000 0000	
679	4	FRF	0000 0000	
689	4	FRF	0000 0000	
449	4	CS11	NOON NNNN	
549	4	CS11	NOON NNNN	
409	4	CS10	XXXX XXXX	
509	4	CS10	XXXX XXXX	
411	3	CS01	0000 0000	
421	3	CS02	0000 0000	
431	3	CS03	0000 0000	
441	3	CS04	0000 0000	
451	3	CS05	0000 0000	
461	3	CS06	0000 0000	
471	3	CS06	NNNN NNNN	
418	29	CS01	???? ????	
428	29	CS02	???? ????	
438	29	CS03	???? ????	
448	29	CS04	???? ????	
458	29	CS05	???? ????	
468	29	CS06	???? ????	
478	29	CS07	???? ????	
111	3	LA01	0000 0000	
121	3	LA02	0000 0000	
131	3	LA03	0000 0000	
141	3	LA04	0000 0000	
151	3	LA05	0000 0000	
161	3	LA06	0000 0000	
171	3	LA07	0000 0000	
181	3	LA08	0000 0000	
191	3	LA09	0000 0000	
101	3	LA10	0000 0000	
229	4	LS02	0000 0000	
329	4	LS02	0000 0000	
239	4	LS03	0000 0000	
339	4	LS03	0000 0000	
249	4	LS04	0000 0000	
349	4	LS04	0000 0000	
259	4	LS05	0000 0000	
359	4	LS05	0000 0000	
269	4	LS06	0000 0000	
369	4	LS06	0000 0000	
279	4	LS07	0000 0000	
379	4	LS07	0000 0000	
289	4	LS08	0000 0000	Low amplitude signal
389	4	LS08	0000 0000	Low amplitude signal
299	4	LS09	0000 0000	
399	4	LS09	0000 0000	
209	4	LS10	NNNN NNNN	LS10 hit by CRAB
309	4	LS10	0000 0000	Lost for remainder
600	12	TIDE	0000 0000	
488	29	CS08	0000 0000	

October 14, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111122222 012345678901234567890123
219	4	LS01	000 00000
319	4	LS01	000 00000
621	3	FRF	000 00000
679	4	FRF	000 00000
689	4	FRF	000 00000
449	4	CS11	NNN N0000
549	4	CS11	NNN N0000
409	4	CS10	NNN N0000
509	4	CS10	NNN N0000
411	3	CS01	000 00000
421	3	CS02	000 00000
431	3	CS03	000 00000
441	3	CS04	000 00000
451	3	CS05	000 00000
461	3	CS06	000 00000
418	29	CS01	??? ?????
428	29	CS02	??? ?????
438	29	CS03	??? ?????
448	29	CS04	??? ?????
458	29	CS05	??? ?????
468	29	CS06	??? ?????
478	29	CS07	??? ?????
625	1	FRF	000 00000
675	1	FRF	000 00000
645	1	FRF	000 00000
630	2	FRF	000 00000
640	2	FRF	000 00000
616	9	FRF	000 00000
624	8	FRF	000 00000
632	6	FRF	000 00000
633	7	FRF	000 00000
600	12	TIDE	000 00000
488	29	CS08	000 00000

October 14, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111122222 012345678901234567890123	
219	4	LS01	0000 0000 000	Collection started on
319	4	LS01	0000 0000 000	generator power
621	3	FRF	0000 0000 000	
679	4	FRF	0000 0000 000	
689	4	FRF	0000 0000 000	
449	4	CS11	000N N000 NNN	
549	4	CS11	000N N000 NNN	
409	4	CS10	000N N000 NNN	
509	4	CS10	000N N000 NNN	
411	3	CS01	0000 0000 000	
421	3	CS02	0000 0000 000	
431	3	CS03	0000 0000 000	
441	3	CS04	0000 0000 000	
451	3	CS05	0000 0000 000	
461	3	CS06	0000 0000 000	
471	3	CS06	NNNN NNNN NNN	
418	29	CS01	???? ???? ???	
428	29	CS02	???? ???? ???	
438	29	CS03	???? ???? ???	
448	29	CS04	???? ???? ???	
458	29	CS05	???? ???? ???	
468	29	CS06	???? ???? ???	
478	29	CS07	???? ???? ???	
111	3	LA01	0000 0000 000	
121	3	LA02	0000 0000 000	
131	3	LA03	0000 0000 000	
141	3	LA04	0000 0000 000	
151	3	LA05	0000 0000 000	
161	3	LA06	0000 0000 000	
171	3	LA07	0000 0000 000	
181	3	LA08	0000 0000 000	
191	3	LA09	0000 0000 000	
101	3	LA10	0000 0000 000	
229	4	LS02	0000 0000 000	
329	4	LS02	0000 0000 000	
239	4	LS03	0000 0000 000	
339	4	LS03	0000 0000 000	
249	4	LS04	0000 0000 000	
349	4	LS04	0000 0000 000	
259	4	LS05	0000 0000 000	
359	4	LS05	0000 0000 000	
269	4	LS06	0000 0000 000	
369	4	LS06	0000 0000 000	
279	4	LS07	0000 0000 000	
379	4	LS07	0000 0000 000	
289	4	LS08	0000 0000 000	Low amplitude signal
389	4	LS08	0000 0000 000	Low amplitude signal
299	4	LS09	0000 0000 000	Noisy strip chart
399	4	LS09	0000 0000 000	Strip chart looks good
209	4	LS10	NNNN NNNN NNN	
309	4	LS10	0000 0000 000	
600	12	TIDE	0000 0000 000	
488	29	CS08	0000 0000 000	

October 15, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	
319	4	LS01	
621	3	FRF	
679	4	FRF	
689	4	FRF	
449	4	CS11	
549	4	CS11	
409	4	CS10	
509	4	CS10	
411	3	CS01	
421	3	CS02	
431	3	CS03	
441	3	CS04	
451	3	CS05	
461	3	CS06	
418	29	CS01	
428	29	CS02	
438	29	CS03	
448	29	CS04	
458	29	CS05	
468	29	CS06	
478	29	CS07	
625	1	FRF	
675	1	FRF	
645	1	FRF	
630	2	FRF	
640	2	FRF	
616	9	FRF	
624	8	FRF	
632	6	FRF	
633	7	FRF	
600	12	TIDE	
488	29	CS08	

October 15 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	0 0000 0000 0000 00
319	4	LS01	0 0000 0000 0000 00
625	1	FRF	0 0000 NNOO 0000 00
675	1	FRF	0 0000 NNOO 0000 00
630	2	FRF	0 0000 NNOO 0000 00
640	2	FRF	0 0000 NNOO 0000 00
621	3	FRF	0 0000 0000 0000 00

October 15 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123	
679	4	FRF	0 0000 0000 0000 00	
689	4	FRF	0 0000 0000 0000 00	
449	4	CS11	N NNNN NOON NNNN NN	
549	4	CS11	N NNNN NOON NNNN NN	
409	4	CS10	N NNNN NOON NNNN NN	
509	4	CS10	N NNNN NOON NNNN NN	
411	3	CS01	0 0000 0000 0000 00	
421	3	CS02	0 0000 0000 0000 00	
431	3	CS03	0 0000 0000 0000 00	
441	3	CS04	0 0000 0000 0000 00	
451	3	CS05	0 0000 0000 0000 00	
461	3	CS06	0 0000 0000 0000 00	
471	3	CS06	N NNNN NNNN NNNN NN	
418	29	CS01	? ???? ???? ???? ??	
428	29	CS02	? ???? ???? ???? ??	
438	29	CS03	? ???? ???? ???? ??	
448	29	CS04	? ???? ???? ???? ??	
458	29	CS05	? ???? ???? ???? ??	
468	29	CS06	? ???? ???? ???? ??	
478	29	CS07	? ???? ???? ???? ??	
645	1	FRF	0 0000 NNOO 0000 00	
632	6	FRF	0 0000 NNOO 0000 00	
633	7	FRF	0 0000 NNOO 0000 00	
616	9	FRF	0 0000 NNOO 0000 00	
111	3	LA01	0 0000 0000 0000 00	
121	3	LA02	0 0000 0000 0000 00	
131	3	LA03	0 0000 0000 0000 00	
141	3	LA04	0 0000 0000 0000 00	
151	3	LA05	0 0000 0000 0000 00	
161	3	LA06	0 0000 0000 0000 00	
171	3	LA07	0 0000 0000 0000 00	
181	3	LA08	0 0000 0000 0000 00	
191	3	LA09	0 0000 0000 0000 00	
101	3	LA10	0 0000 0000 0000 00	
229	4	LS02	0 0000 0000 0000 00	
329	4	LS02	0 0000 0000 0000 00	
239	4	LS03	0 0000 0000 0000 00	
339	4	LS03	0 0000 0000 0000 00	
249	4	LS04	0 0000 0000 0000 00	
349	4	LS04	0 0000 0000 0000 00	
259	4	LS05	0 0000 0000 0000 00	
359	4	LS05	0 0000 0000 0000 00	
269	4	LS06	0 0000 0000 0000 00	
369	4	LS06	0 0000 0000 0000 00	
279	4	LS07	0 0000 0000 0000 00	
379	4	LS07	0 0000 0000 0000 00	
289	4	LS08	0 0000 0000 0000 00	Low amplitude signal
389	4	LS08	0 0000 0000 0000 00	Low amplitude signal
299	4	LS09	0 0000 0000 0000 00	
399	4	LS09	0 0000 0000 0000 00	
209	4	LS10	N NNNN NNNN NNNN NN	
309	4	LS10	0 0000 0000 0000 00	
600	12	TIDE	0 0000 0000 0000 00	
488	29	CS08	0 0000 0000 0000 00	

October 16, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 1111111111112222 012345678901234567890123
219	4	LS01	0000000000
319	4	LS01	0000000000
621	3	FRF	0000000000
679	4	FRF	0000000000
689	4	FRF	0000000000
449	4	CS11	000000000N
549	4	CS11	000000000N
409	4	CS10	XXXXXXXXXX
509	4	CS10	XXXXXXXXXX
411	3	CS01	0000000000
421	3	CS02	0000000000
431	3	CS03	????00?000
441	3	CS04	0000000000
451	3	CS05	0000000000
461	3	CS06	0000000000
418	29	CS01	??????????
428	29	CS02	??????????
438	29	CS03	??????????
448	29	CS04	??????????
458	29	CS05	??????????
468	29	CS06	??????????
478	29	CS07	??????????
625	1	FRF	0000000000
675	1	FRF	0000000000
645	1	FRF	0000000000
630	2	FRF	0000000000
640	2	FRF	0000000000
616	9	FRF	0000000000
624	8	FRF	0000000000
632	6	FRF	0000000000
633	7	FRF	0000000000
600	12	TIDE	0000000000
488	29	CS08	0000000000

October 16, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 1111111111112222 012345678901234567890123
219	4	LS01	00 0000 0000 0000 0
319	4	LS01	00 0000 0000 0000 0
625	1	FRF	00 0000 0000 0000 0
675	1	FRF	00 0000 0000 0000 0
630	2	FRF	00 0000 0000 0000 0
640	2	FRF	00 0000 0000 0000 0
621	3	FRF	00 0000 0000 0000 0

October 16, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 1111111111112222 012345678901234567890123	
679	4	FRF	00 0000 0000 0000 0	
689	4	FRF	00 0000 0000 0000 0	
449	4	CS11	00 0000 0000 0000 0	
549	4	CS11	00 0000 0000 0000 0	
409	4	CS10	NN NNNN NOON NNNN N	
509	4	CS10	NN NNNN NOON NNNN N	
411	3	CS01	00 0000 0000 0000 0	
421	3	CS02	00 0000 0000 0000 0	
431	3	CS03	00 0000 0000 0000 0	
441	3	CS04	00 0000 0000 0000 0	
451	3	CS05	00 0000 0000 0000 0	
461	3	CS06	00 0000 0000 0000 0	
471	3	CS06	NN NNNN NNNN NNNN N	
418	29	CS01	?? ???? ???? ???? ?	
428	29	CS02	?? ???? ???? ???? ?	
438	29	CS03	?? ???? ???? ???? ?	
448	29	CS04	?? ???? ???? ???? ?	
458	29	CS05	?? ???? ???? ???? ?	
468	29	CS06	?? ???? ???? ???? ?	
478	29	CS07	?? ???? ???? ???? ?	
645	1	FRF	00 0000 0000 0000 0	
632	6	FRF	00 0000 0000 0000 0	
633	7	FRF	00 0000 0000 0000 0	
616	9	FRF	00 0000 0000 0000 0	
111	3	LA01	00 0000 0000 0000 0	
121	3	LA02	00 0000 0000 0000 0	
131	3	LA03	00 0000 0000 0000 0	
141	3	LA04	00 0000 0000 0000 0	
151	3	LA05	00 0000 0000 0000 0	
161	3	LA06	00 0000 0000 0000 0	
171	3	LA07	00 0000 0000 0000 0	
181	3	LA08	00 0000 0000 0000 0	
191	3	LA09	00 0000 0000 0000 0	
101	3	LA10	00 0000 0000 0000 0	
229	4	LS02	00 0000 0000 0000 0	
329	4	LS02	00 0000 0000 0000 0	
239	4	LS03	00 0000 0000 0000 0	
339	4	LS03	00 0000 0000 0000 0	
249	4	LS04	00 0000 0000 0000 0	
349	4	LS04	00 0000 0000 0000 0	
259	4	LS05	00 0000 0000 0000 0	
359	4	LS05	00 0000 0000 0000 0	
269	4	LS06	00 0000 0000 0000 0	
369	4	LS06	00 0000 0000 0000 0	
279	4	LS07	00 0000 0000 0000 0	
379	4	LS07	00 0000 0000 0000 0	
289	4	LS08	00 0000 0000 0000 0	Low amplitude signal
389	4	LS08	00 0000 0000 0000 0	Low amplitude signal
299	4	LS09	00 0000 0000 0000 0	
399	4	LS09	00 0000 0000 0000 0	
209	4	LS10	NN NNNN NNNN NNNN N	
309	4	LS10	00 0000 0000 0000 0	
600	12	TIDE	00 0000 0000 0000 0	
488	29	CS08	00 0000 0000 0000 0	

October 17, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
449	4	CS11	NNNNNNNNNNNNNNNNNNNNNNNN
549	4	CS11	NNNNNNOONNNNOONNNNNNNNNN
409	4	CS10	XXXXXXXXXNNNOONNNNNNNNNN
509	4	CS10	XXXXXXXXXNNNNNNNNNNNNNNN
411	3	CS01	000000000000000000000000
421	3	CS02	000000000000000000000000
431	3	CS03	000000000000000000000000
441	3	CS04	000000000000000000000000
451	3	CS05	000000000000000000000000
461	3	CS06	000000000000000000000000
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNNNNNNNNNN
488	29	CS08	000000000000000000000000

October 17, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	000 0000 0000 0000 0
319	4	LS01	000 0000 0000 0000 0
625	1	FRF	000 0000 0000 0000 0
675	1	FRF	000 0000 0000 0000 0
630	2	FRF	000 0000 0000 0000 0
640	2	FRF	000 0000 0000 0000 0
621	3	FRF	000 0000 0000 0000 0

October 17, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123	
679	4	FRF	000 0000 0000 0000 0	
689	4	FRF	000 0000 0000 0000 0	
449	4	CS11	NNN NOON NOON NNNN N	
549	4	CS11	NNN NOON NOON NNNN N	
409	4	CS10	NNN NOON NOON NNNN N	
509	4	CS10	NNN NOON NOON NNNN N	
411	3	CS01	000 0000 0000 0000 0	
421	3	CS02	000 0000 0000 0000 0	
431	3	CS03	000 0000 0000 0000 0	
441	3	CS04	000 0000 0000 0000 0	
451	3	CS05	000 0000 0000 0000 0	
461	3	CS06	000 0000 0000 0000 0	
471	3	CS06	NNN NNNN NNNN NNNN N	
418	29	CS01	??? ???? ???? ???? ?	
428	29	CS02	??? ???? ???? ???? ?	
438	29	CS03	??? ???? ???? ???? ?	
448	29	CS04	??? ???? ???? ???? ?	
458	29	CS05	??? ???? ???? ???? ?	
468	29	CS06	??? ???? ???? ???? ?	
478	29	CS07	??? ???? ???? ???? ?	
645	1	FRF	000 000C 0000 0000 0	
632	6	FRF	000 0000 0000 0000 0	
633	7	FRF	000 0000 0000 0000 0	
616	9	FRF	000 0000 0000 0000 0	
111	3	LA01	000 0000 0000 0000 0	
121	3	LA02	000 0000 0000 0000 0	
131	3	LA03	000 0000 0000 0000 0	
141	3	LA04	000 0000 0000 0000 0	
151	3	LA05	000 0000 0000 0000 0	
161	3	LA06	000 0000 0000 0000 0	
171	3	LA07	000 0000 0000 0000 0	
181	3	LA08	000 0000 0000 0000 0	
191	3	LA09	000 0000 0000 0000 0	
101	3	LA10	000 0000 0000 000C 0	
229	4	LS02	000 0000 0000 0000 0	
329	4	LS02	000 0000 0000 0000 0	
239	4	LS03	000 0000 0000 0000 0	
339	4	LS03	000 0000 0000 0000 0	
249	4	LS04	000 0000 0000 0000 0	
349	4	LS04	000 0000 0000 0000 0	
259	4	LS05	000 0000 0000 0000 0	
359	4	LS05	000 0000 0000 0000 0	
269	4	LS06	000 0000 0000 0000 0	
369	4	LS06	000 0000 0000 0000 0	
279	4	LS07	000 0000 0000 0000 0	
379	4	LS07	000 0000 0000 0000 0	
289	4	LS08	000 0000 0000 0000 0	Low amplitude signal
389	4	LS08	000 0000 0000 0000 0	Low amplitude signal
299	4	LS09	000 0000 0000 0000 0	
399	4	LS09	000 0000 0000 0000 0	
209	4	LS10	NNN NNNN NNNN NNNN N	
309	4	LS10	000 0000 0000 0000 0	
600	12	TIDE	NNN NNNN NNNN NNNN N	
488	29	CS08	000 0000 0000 0000 0	

October 18, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
449	4	CS11	NNNNNNNNNNNNNOONNNNNNNNN
549	4	CS11	NNNNNNNNNNNNNOONNNNNNNNN
409	4	CS10	NNNNNNNNNNNNNOONNNNNNNNN
509	4	CS10	NNNNNNNNNNNNNOONNNNNNNNN
411	3	CS01	000000000000000000000000
421	3	CS02	000000000000000000000000
431	3	CS03	000000000000000000000000
441	3	CS04	000000000000000000000000
451	3	CS05	000000000000000000000000
461	3	CS06	000000000000000000000000
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNNNNNNNNNN
488	29	CS08	000000000000000000000000

October 18, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123			
219	4	LS01	000	0000	0000	0000
319	4	LS01	000	0000	0000	0000
625	1	FRF	000	0000	0000	0000
675	1	FRF	000	0000	0000	0000
630	2	FRF	000	0000	0000	0000
640	2	FRF	000	0000	0000	0000
621	3	FRF	000	0000	0000	0000

October 18, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123				
679	4	FRF	000	0000	0000	0000	
689	4	FRF	000	0000	0000	0000	
449	4	CS11	NNN	NNNN	NOON	NNNN	
549	4	CS11	NNN	NNNN	NOON	NNNN	
409	4	CS10	NNN	NNNN	NOON	NNNN	
509	4	CS10	NNN	NNNN	NOON	NNNN	
411	3	CS01	000	0000	0000	0000	
421	3	CS02	000	0000	0000	0000	
431	3	CS03	000	0000	0000	0000	
441	3	CS04	000	0000	0000	0000	
451	3	CS05	000	0000	0000	0000	
461	3	CS06	000	0000	0000	0000	
471	3	CS06	NNN	NNNN	NNNN	NNNN	
418	29	CS01	???	????	????	????	
428	29	CS02	???	????	????	????	
438	29	CS03	???	????	????	????	
448	29	CS04	???	????	????	????	
458	29	CS05	???	????	????	????	
468	29	CS06	???	????	????	????	
478	29	CS07	???	????	????	????	
645	1	FRF	000	0000	0000	0000	
632	6	FRF	000	0000	0000	0000	
633	7	FRF	000	0000	0000	0000	
616	9	FRF	000	0000	0000	0000	
111	3	LA01	000	0000	0000	0000	
121	3	LA02	000	0000	0000	0000	
131	3	LA03	000	0000	0000	0000	
141	3	LA04	000	0000	0000	0000	
151	3	LA05	000	0000	0000	0000	
161	3	LA06	000	0000	0000	0000	
171	3	LA07	000	0000	0000	0000	
181	3	LA08	000	0000	0000	0000	
191	3	LA09	000	0000	0000	0000	
101	3	LA10	000	0000	0000	0000	
229	4	LS02	000	0000	0000	0000	
329	4	LS02	000	0000	0000	0000	
239	4	LS03	000	0000	0000	0000	
339	4	LS03	000	0000	0000	0000	
249	4	LS04	000	0000	0000	0000	
34,	4	LS04	000	0000	0000	0000	
259	4	LS05	000	0000	0000	0000	LS05 instrument pipe hit by
359	4	LS05	000	0000	0000	0000	CRAB at 1400 - probe pike not hit
269	4	LS06	000	0000	0000	0000	
369	4	LS06	000	0000	0000	0000	
279	4	LS07	000	0000	0000	0000	
379	4	LS07	000	0000	0000	0000	
289	4	LS08	000	0000	0000	0000	Low amplitude signal
389	4	LS08	000	0000	0000	0000	Low amplitude signal
299	4	LS09	000	0000	0000	0000	
399	4	LS09	000	0000	0000	0000	
209	4	LS10	NNN	NNNN	NNNN	NNNN	
309	4	LS10	000	0000	0000	0000	
600	12	TIDE	NNN	NNNN	NNNN	NNNN	
488	29	CS08	000	0000	0000	0000	

October 19, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 1111111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
449	4	CS11	NNNNNNNNNNNNNOONNNNNNNNN
549	4	CS11	NNNNNNNNNNNNNOONNNNNNNNN
409	4	CS10	NNNNNNNNNNNNNOONNNNNNNNN
509	4	CS10	NNNNNNNNNNNNNOONNNNNNNNN
411	3	CS01	000000000000000000000000
421	3	CS02	000000000000000000000000
431	3	CS03	000000000000000000000000
441	3	CS04	000000000000000000000000
451	3	CS05	000000000000000000000000
461	3	CS06	000000000000000000000000
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNNNNNNNNNN
488	29	CS08	000000000000000000000000

October 19, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 1111111111112222 012345678901234567890123
219	4	LS01	0000 0000 0000 0000
319	4	LS01	0000 0000 0000 0000
625	1	FRF	0000 0000 0000 0000
675	1	FRF	0000 0000 0000 0000
630	2	FRF	0000 0000 0000 0000
640	2	FRF	0000 0000 0000 0000
621	3	FRF	0000 0000 0000 0000

October 19, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 1111111111112222 012345678901234567890123	
679	4	FRF	0000 0000 0000 0000	
689	4	FRF	0000 0000 0000 0000	
449	4	CS11	NNNN NNNN NOON NNNN	
549	4	CS11	NNNN NNNN NOON NNNN	
409	4	CS10	NNNN NNNN NOON NNNN	
509	4	CS10	NNNN NNNN NOON NNNN	
411	3	CS01	0000 0000 0000 0000	
421	3	CS02	0000 0000 0000 0000	
431	3	CS03	0000 0000 0000 0000	
441	3	CS04	0000 0000 0000 0000	
451	3	CS05	0000 0000 0000 0000	
461	3	CS06	0000 0000 0000 0000	
471	3	CS06	NNNN NNNN NNNN NNNN	
418	29	CS01	???? ???? ???? ????	
428	29	CS02	???? ???? ???? ????	
438	29	CS03	???? ???? ???? ????	
448	29	CS04	???? ???? ???? ????	
458	29	CS05	???? ???? ???? ????	
468	29	CS06	???? ???? ???? ????	
478	29	CS07	???? ???? ???? ????	
645	1	FRF	0000 0000 0000 0000	
632	6	FRF	0000 0000 0000 0000	
633	7	FRF	0000 0000 0000 0000	
616	9	FRF	0000 0000 0000 0000	
111	3	LA01	0000 0000 0000 0000	
121	3	LA02	0000 0000 0000 0000	
131	3	LA03	0000 0000 0000 0000	
141	3	LA04	0000 0000 0000 0000	
151	3	LA05	0000 0000 0000 0000	
161	3	LA06	0000 NNNN NNNN NNNN	
171	3	LA07	0000 0000 0000 0000	
181	3	LA08	0000 0000 0000 0000	
191	3	LA09	0000 0000 0000 0000	
101	3	LA10	0000 0000 0000 0000	
229	4	LS02	0000 0000 0000 0000	
329	4	LS02	0000 0000 0000 0000	
239	4	LS03	0000 0000 0000 0000	
339	4	LS03	0000 0000 0000 0000	
249	4	LS04	0000 0000 0000 0000	
349	4	LS04	0000 0000 0000 0000	
259	4	LS05	0000 0000 0000 0000	
359	4	LS05	0000 0000 NNNN NNNN	
269	4	LS06	0000 0000 0000 0000	
369	4	LS06	0000 0000 0000 0000	
279	4	LS07	0000 0000 0000 0000	
379	4	LS07	0000 0000 0000 0000	
289	4	LS08	NNNN NNNN NNNN NNNN	Sensor goes bad
389	4	LS08	NNNN NNNN NNNN NNNN	Sensor goes bad
299	4	LS09	0000 0000 0000 0000	
399	4	LS09	0000 0000 0000 0000	
209	4	LS10	NNNN NNNN NNNN NNNN	
309	4	LS10	0000 0000 0000 0000	
600	12	TIDE	NNNN NNNN NNNN NNNN	
488	29	CS08	0000 0000 0000 0000	

October 20, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
449	4	CS11	NNNNNNNNOONNNNOONNNNNNNN
549	4	CS11	NNNNNNNNOONNNNOONNNNNNNN
409	4	CS10	NNNNNNNNOONNNNOONNNNNNNN
509	4	CS10	NNNNNNNNOONNNNOONNNNNNNN
411	3	CS01	000000000000000000000000
421	3	CS02	000000000000000000000000
431	3	CS03	000000000000000000000000
441	3	CS04	000000000000000000000000
451	3	CS05	000000000000000000000000
461	3	CS06	000000000000000000000000
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNNNNNNNNNN
488	29	CS08	000000000000000000000000

October 20, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	0000 0000 0000 0000
319	4	LS01	0000 0000 0000 0000
625	1	FRF	0000 0000 0000 0000
675	1	FRF	0000 0000 0000 0000
630	2	FRF	0000 0000 0000 0000
640	2	FRF	0000 0000 0000 0000
621	3	FRF	0000 0000 0000 0000

October 20, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123	
679	4	FRF	0000 0000 0000 0000	
689	4	FRF	0000 0000 0000 0000	
449	4	CS11	NNNN NOON NOON NNNN	
549	4	CS11	NNNN NOON NOON NNNN	
409	4	CS10	NNNN NOON NOON NNNN	
509	4	CS10	NNNN NOON NOON NNNN	
411	3	CS01	0000 0000 0000 0000	
421	3	CS02	0000 0000 0000 0000	
431	3	CS03	0000 0000 0000 0000	
441	3	CS04	0000 0000 0000 0000	
451	3	CS05	0000 0000 0000 0000	
461	3	CS06	0000 0000 0000 0000	
471	3	CS06	NNNN NNNN NNNN NNNN	
418	29	CS01	???? ???? ???? ????	
428	29	CS02	???? ???? ???? ????	
438	29	CS03	???? ???? ???? ????	
448	29	CS04	???? ???? ???? ????	
458	29	CS05	???? ???? ???? ????	
468	29	CS06	???? ???? ???? ????	
478	29	CS07	???? ???? ???? ????	
645	1	FRF	0000 0000 0000 0000	
632	6	FRF	0000 0000 0000 0000	
633	7	FRF	0000 0000 0000 0000	
616	9	FRF	0000 0000 0000 0000	
111	3	LA01	0000 0000 0000 0000	
121	3	LA02	0000 0000 0000 0000	
131	3	LA03	0000 0000 0000 0000	
141	3	LA04	0000 0000 0000 0000	
151	3	LA05	0000 0000 0000 0000	
161	3	LA06	NNNN NNNN NNNN NNNN	
171	3	LA07	0000 0000 0000 0000	
181	3	LA08	0000 0000 0000 0000	
191	3	LA09	0000 0000 0000 0000	
101	3	LA10	0000 0000 0000 0000	
229	4	LS02	0000 0000 0000 0000	
329	4	LS02	0000 0000 0000 0000	
239	4	LS03	0000 0000 0000 0000	
339	4	LS03	0000 0000 0000 0000	
249	4	LS04	0000 0000 0000 0000	
349	4	LS04	0000 0000 0000 0000	
259	4	LS05	0000 0000 ???? ????	X channel flaky 1300 on
359	4	LS05	0000 0000 NNNN NNNN	Y channel bad 1300 on
269	4	LS06	0000 0000 0000 0000	
369	4	LS06	0000 0000 0000 0000	
279	4	LS07	0000 0000 0000 0000	
379	4	LS07	0000 0000 0000 0000	
289	4	LS08	NNNN NNNN NNNN NNNN	
389	4	LS08	NNNN NNNN NNNN NNNN	
299	4	LS09	0000 0000 0000 0000	
399	4	LS09	0000 0000 0000 0000	
209	4	LS10	NNNN NNNN NNNN NNNN	
309	4	LS10	0000 0000 0000 0000	
600	12	TIDE	NNNN NNNN NNNN NNNN	
488	29	CS08	0000 0000 0000 0000	

October 21, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	000000000000000000000000
319	4	LS01	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
449	4	CS11	NNNNNNNNNNNNNNNNNNNNNNNN
549	4	CS11	NNNNNNNNNNNNNNNNNNNNNNNN
409	4	CS10	NNNNNNNNNNNNNNNNNNNNNNNN
509	4	CS10	NNNNNNNNNNNNNNNNNNNNNNNN
411	3	CS01	000000000000000000000000
421	3	CS02	000000000000000000000000
431	3	CS03	000000000000000000000000
441	3	CS04	000000000000000000000000
451	3	CS05	000000000000000000000000
461	3	CS06	000000000000000000000000
418	29	CS01	????????????????????????
428	29	CS02	????????????????????????
438	29	CS03	????????????????????????
448	29	CS04	????????????????????????
458	29	CS05	????????????????????????
468	29	CS06	????????????????????????
478	29	CS07	????????????????????????
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
632	6	FRF	000000000000000000000000
633	7	FRF	000000000000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNNNNNNNNNN
488	29	CS08	000000000000000000000000

October 21, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123
219	4	LS01	0000 0000 0000 0000
319	4	LS01	0000 0000 0000 0000
625	1	FRF	0000 0000 0000 0000
675	1	FRF	0000 0000 0000 0000
630	2	FRF	0000 0000 0000 0000
640	2	FRF	0000 0000 0000 0000
621	3	FRF	0000 0000 0000 0000

October 21, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 11111111112222 012345678901234567890123	
679	4	FRF	0000 0000 0000 0000	
689	4	FRF	0000 0000 0000 0000	
449	4	CS11	NNNN NNNN NNNN NNNN	
549	4	CS11	NNNN NNNN NNNN NNNN	
409	4	CS10	NNNN NNNN NNNN NNNN	
509	4	CS10	NNNN NNNN NNNN NNNN	
411	3	CS01	0000 0000 0000 0000	
421	3	CS02	0000 0000 0000 0000	
431	3	CS03	0000 0000 0000 0000	
441	3	CS04	0000 0000 0000 0000	
451	3	CS05	0000 0000 0000 0000	
461	3	CS06	0000 0000 0000 0000	
471	3	CS06	NNNN NNNN NNNN NNNN	
418	29	CS01	???? ???? ???? ????	
428	29	CS02	???? ???? ???? ????	
438	29	CS03	???? ???? ???? ????	
448	29	CS04	???? ???? ???? ????	
458	29	CS05	???? ???? ???? ????	
468	29	CS06	???? ???? ???? ????	
478	29	CS07	???? ???? ???? ????	
645	1	FRF	0000 0000 0000 0000	
632	6	FRF	0000 0000 0000 0000	
633	7	FRF	0000 0000 0000 0000	
616	9	FRF	0000 0000 0000 0000	
111	3	LA01	0000 0000 0000 0000	
121	3	LA02	0000 0000 0000 0000	
131	3	LA03	0000 0000 0000 0000	
141	3	LA04	0000 0000 0000 0000	
151	3	LA05	0000 0000 0000 0000	
161	3	LA06	NNNN NNNN NNNN NNNN	
171	3	LA07	0000 0000 0000 0000	
181	3	LA08	0000 0000 0000 0000	
191	3	LA09	0000 0000 0000 0000	
101	3	LA10	0000 0000 0000 0000	
229	4	LS02	0000 0000 0000 0000	
329	4	LS02	0000 0000 0000 0000	
239	4	LS03	0000 0000 ??NN NNNN	First sign of probe burial for LS03, LS04 at 1430
339	4	LS03	0000 0000 ??NN NNNN	
249	4	LS04	0000 0000 0000 0000	
349	4	LS04	0000 0000 0000 0000	
259	4	LS05	0000 XXXX XXXX XXXX	
359	4	LS05	NNNN XXXX XXXX XXXX	
269	4	LS06	NNNN NNNN NNNN NNNN	Sensor became intermittent
369	4	LS06	NNNN NNNN NNNN NNNN	Sensor became intermittent
279	4	LS07	0000 0000 0000 0000	
379	4	LS07	0000 0000 0000 0000	
289	4	LS08	NNNN NNNN NNNN NNNN	
389	4	LS08	NNNN NNNN NNNN NNNN	
299	4	LS09	0000 0000 0000 0000	
399	4	LS09	0000 0000 0000 0000	
209	4	LS10	NNNN NNNN NNNN NNNN	
309	4	LS10	0000 0000 0000 0000	
600	12	TIDE	NNNN NNNN NNNN NNNN	
488	29	CS08	0000 0000 0000 0000	

October 22, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	00000000
319	4	LS01	00000000
621	3	FRF	00000000
679	4	FRF	00000000
689	4	FRF	00000000
449	4	CS11	NNNNNNNN
549	4	CS11	NNNNNNNN
409	4	CS10	NNNNNNNN
509	4	CS10	NNNNNNNN
411	3	CS01	00000000
421	3	CS02	00000000
431	3	CS03	00000000
441	3	CS04	00000000
451	3	CS05	00000000
461	3	CS06	00000000
418	29	CS01	????????
428	29	CS02	????????
438	29	CS03	????????
448	29	CS04	????????
458	29	CS05	????????
468	29	CS06	????????
478	29	CS07	????????
625	1	FRF	00000000
675	1	FRF	00000000
645	1	FRF	00000000
630	2	FRF	00000000
640	2	FRF	00000000
616	9	FRF	00000000
624	8	FRF	00000000
632	6	FRF	00000000
633	7	FRF	00000000
600	12	TIDE	NNNNNNNN
488	29	CS08	00000000

October 22, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123			
219	4	LS01	0000	0000	0000	0000
319	4	LS01	0000	0000	0000	0000
625	1	FRF	0000	0000	0000	0000
675	1	FRF	0000	0000	0000	0000
630	2	FRF	0000	0000	0000	0000
640	2	FRF	0000	0000	0000	0000
621	3	FRF	0000	0000	0000	0000

October 22, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123			
679	4	FRF	0000	0000	0000	0000
689	4	FRF	0000	0000	0000	0000
449	4	CS11	NNNN	NOON	NOON	NNNN
549	4	CS11	NNNN	NOON	NOON	NNNN
409	4	CS10	NNNN	NOON	NOON	NNNN
509	4	CS10	NNNN	NOON	NOON	NNNN
411	3	CS01	0000	0000	0000	0000
421	3	CS02	0000	0000	0000	0000
431	3	CS03	0000	0000	0000	0000
441	3	CS04	0000	0000	0000	0000
451	3	CS05	0000	0000	0000	0000
461	3	CS06	0000	0000	0000	0000
471	3	CS06	NNNN	NNNN	NNNN	NNNN
418	29	CS01	????	????	????	????
428	29	CS02	????	????	????	????
438	29	CS03	????	????	????	????
448	29	CS04	????	????	????	????
458	29	CS05	????	????	????	????
468	29	CS06	????	????	????	????
478	29	CS07	????	????	????	????
645	1	FRF	0000	0000	0000	0000
632	6	FRF	0000	0000	0000	0000
633	7	FRF	0000	0000	0000	0000
616	9	FRF	0000	0000	0000	0000
111	3	LA01	0000	0000	0000	0000
121	3	LA02	0000	0000	0000	0000
131	3	LA03	0000	0000	0000	0000
141	3	LA04	0000	0000	0000	0000
151	3	LA05	0000	0000	0000	0000
161	3	LA06	NNNN	NNNN	NNNN	NNNN
171	3	LA07	0000	0000	0000	0000
181	3	LA08	0000	0000	0000	0000
191	3	LA09	0000	0000	0000	0000
101	3	LA10	0000	0000	0000	0000
229	4	LS02	0000	0000	0000	0000
329	4	LS02	0000	0000	0000	0000
239	4	LS03	0000	0000	0000	0000
339	4	LS03	0000	0000	0000	0000
249	4	LS04	0000	0000	0000	0000
349	4	LS04	0000	0000	0000	0000
279	4	LS07	0000	0000	0000	0000
379	4	LS07	0000	0000	0000	0000
289	4	LS08	NNNN	NNNN	NNNN	NNNN
389	4	LS08	NNNN	NNNN	NNNN	NNNN
299	4	LS09	0000	0000	0000	0000
399	4	LS09	0000	0000	0000	0000
209	4	LS10	NNNN	NNNN	NNNN	NNNN
309	4	LS10	0000	0000	0000	0000
600	12	TIDE	NNNN	NNNN	NNNN	NNNN
488	29	CS08	0000	0000	0000	0000

October 23, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	00
319	4	LS01	00
621	3	FRF	0000000000000000
679	4	FRF	0000000000000000
689	4	FRF	0000000000000000
449	4	CS11	NN
549	4	CS11	NN
409	4	CS10	NN
509	4	CS10	NN
411	3	CS01	00
421	3	CS02	00
431	3	CS03	00
441	3	CS04	00
451	3	CS05	00
461	3	CS06	00
418	29	CS01	??
428	29	CS02	??
438	29	CS03	??
448	29	CS04	??
458	29	CS05	??
468	29	CS06	??
478	29	CS07	??
625	1	FRF	0000000000000000
675	1	FRF	0000000000000000
645	1	FRF	0000000000000000
630	2	FRF	0000000000000000
640	2	FRF	0000000000000000
616	9	FRF	0000000000000000
624	8	FRF	0000000000000000
632	6	FRF	0000000000000000
633	7	FRF	0000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNN
488	29	CS08	00

October 22, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
219	4	LS01	0000
319	4	LS01	0000
625	1	FRF	0000 0000 0000

October 23, 1986 VAX Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 111111111112222 012345678901234567890123
675	1	FRF	0000 0000 0000
630	2	FRF	0000 0000 0000
640	2	FRF	0000 0000 0000
621	3	FRF	0000 0000 0000
679	4	FRF	0000 0000 0000
689	4	FRF	0000 0000 0000
449	4	CS11	NNNN
549	4	CS11	NNNN
409	4	CS10	NNNN
509	4	CS10	NNNN
411	3	CS01	0000
421	3	CS02	0000
431	3	CS03	0000
441	3	CS04	0000
451	3	CS05	0000
461	3	CS06	0000
471	3	CS06	NNNN NNNN NNNN
418	29	CS01	????
428	29	CS02	????
438	29	CS03	????
448	29	CS04	????
458	29	CS05	????
468	29	CS06	????
478	29	CS07	????
645	1	FRF	0000 0000 0000
632	6	FRF	0000 0000 0000
633	7	FRF	0000 0000 0000
616	9	FRF	0000 0000 0000
111	3	LA01	0000 0000 0000
121	3	LA02	0000 0000 0000
131	3	LA03	0000 0000 0000
141	3	LA04	0000 0000 0000
151	3	LA05	0000 0000 0000
161	3	LA06	NNNN NNNN NNNN
171	3	LA07	0000 0000 0000
181	3	LA08	0000 0000 0000
191	3	LA09	0000 0000 0000
101	3	LA10	0000 0000 0000
229	4	LS02	0000 0000 0000
329	4	LS02	0000 0000 0000
239	4	LS03	0000 0000 0000
339	4	LS03	0000 0000 0000
249	4	LS04	0000 0000 0000
349	4	LS04	0000 0000 0000
279	4	LS07	0000 0000 0000
379	4	LS07	0000 0000 0000
289	4	LS08	NNNN NNNN NNNN
389	4	LS08	NNNN NNNN NNNN
299	4	LS09	0000 0000 0000
399	4	LS09	0000 0000 0000
209	4	LS10	NNNN NNNN NNNN
309	4	LS10	0000 0000 0000
600	12	TIDE	NNNN NNNN NNNN
488	29	CS08	0000

October 24, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
625	1	FRF	00000000 00000000000000
675	1	FRF	00000000 00000000000000
645	1	FRF	00000000 00000000000000
616	9	FRF	00000000 00000000000000
621	3	FRF	00000000 00000000000000
679	4	FRF	00000000 00000000000000
689	4	FRF	00000000 00000000000000
624	8	FRF	00000000 00000000000000
630	2	FRF	00000000 00000000000000
640	2	FRF	00000000 00000000000000
632	6	WIND	00000000 00000000000000
633	7	WIND	00000000 00000000000000
111	3	LA01	?0000000000000
121	3	LA02	N0000000000000
131	3	LA03	N0000000000000
141	3	LA04	N0000000000000
151	3	LA05	N0000000000000
161	3	LA06	N0000000000000
171	3	LA07	N0000000000000
181	3	LA08	N0000000000000
191	3	LA09	N0000000000000
101	3	LA10	N0000000000000
600	12	TIDE	NNNNNNNN NNNNNNNNNNNNNN

October 25, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
632	6	WIND	000000000000000000000000
633	7	WIND	000000000000000000000000
111	3	LA01	000000000000000000000000
121	3	LA02	000000000000000000000000
131	3	LA03	000000000000000000000000
141	3	LA04	000000000000000000000000
151	3	LA05	000000000000000000000000
161	3	LA06	000000000000000000000000
171	3	LA07	000000000000000000000000
181	3	LA08	000000000000000000000000
191	3	LA09	000000000000000000000000
101	3	LA10	000000000000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNNNNNNNNNN

October 26, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
632	6	WIND	000000000000000000000000
633	7	WIND	000000000000000000000000
111	3	LA01	000000000000000000000000
121	3	LA02	000000000000000000000000
131	3	LA03	000000000000000000000000
141	3	LA04	000000000000000000000000
151	3	LA05	000000000000000000000000
161	3	LA06	000000000000000000000000
171	3	LA07	000000000000000000000000
181	3	LA08	000000000000000000000000
191	3	LA09	000000000000000000000000
101	3	LA10	000000000000000000000000
600	12	TIDE	NNNNNNNNNNNNNNNNNNNNNNNN

October 27, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
632	6	WIND	000000000000000000000000
633	7	WIND	000000000000000000000000
111	3	LA01	000000000000000000000000
121	3	LA02	000000000000000000000000
131	3	LA03	000000000000000000000000
141	3	LA04	000000000000000000000000
151	3	LA05	000000000000000000000000
161	3	LA06	000000000000000000000000
171	3	LA07	000000000000000000000000
181	3	LA08	000000000000000000000000
191	3	LA09	000000000000000000000000
101	3	LA10	000000000000000000000000
600	12	TIDE	NNNNNNNNNXXXXXXXXXXXXXXX

October 28, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
625	1	1900	000000000000000000000000
675	1	1420	000000000000000000000000
645	1	780	000000000000000000000000
616	9	ATMP	000000000000000000000000
621	3	PUVS	000000000000000000000000
679	4	PUVX	000000000000000000000000
689	4	PUVY	000000000000000000000000
624	8	FRF	000000000000000000000000
630	2	16KM	000000000000000000000000
640	2	1KM	000000000000000000000000
632	6	WIND	000000000000000000000000
633	7	WIND	000000000000000000000000
111	3	LA01	0000000000000?0000000000
121	3	LA02	0000000000000?0000000000
131	3	LA03	0000000000000?0000000000
141	3	LA04	0000000000000?0000000000
151	3	LA05	0000000000000?0000000000
161	3	LA06	0000000000000?0000000000
171	3	LA07	0000000000000?0000000000
181	3	LA08	0000000000000?0000000000
191	3	LA09	0000000000000?0000000000
101	3	LA10	0000000000000?0000000000

October 29, 1986: NOVA-4 Data Collection

Gage Number	Gage Type	Gage Name	Hourly Status 012345678901234567890123
625	1	FRF	000000000000000000000000
675	1	FRF	000000000000000000000000
645	1	FRF	000000000000000000000000
616	9	FRF	000000000000000000000000
621	3	FRF	000000000000000000000000
679	4	FRF	000000000000000000000000
689	4	FRF	000000000000000000000000
624	8	FRF	000000000000000000000000
630	2	FRF	000000000000000000000000
640	2	FRF	000000000000000000000000
632	6	WIND	000000000000000000000000
633	7	WIND	000000000000000000000000
111	3	LA01	000000000000?00000000000
121	3	LA02	000000000000?00000000000
131	3	LA03	000000000000?00000000000
141	3	LA04	000000000000?00000000000
151	3	LA05	000000000000?00000000000
161	3	LA06	000000000000?00000000000
171	3	LA07	000000000000?00000000000
181	3	LA08	000000000000?00000000000
191	3	LA09	000000000000?00000000000
101	3	LA10	000000000000?00000000000